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Jonny Hanson

Large carnivore reintroductions to Britain and Ireland: farmers' perspectives and management options

June 2024

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"Leading positive change in agriculture. Inspiring passion and potential in people."

Title	Large carnivore reintroductions to Britain and Ireland: farmers' perspectives and management options
Scholar	Jonny Hanson
Sponsor	The Thomas Henry Foundation
Objectives of Study Tour	Objective 1: Explore farmers' perspectives towards: a) the reintroduction of grey wolves, Eurasian lynx and brown bears to Britain and Ireland; b) the suite of management tools that could be used to manage coexistence in the event of reintroductions of any of these species. Objective 2: Explore examples of how: a) coexistence between large carnivores, large carnivore conservationists, livestock farmers and other relevant stakeholders is managed; b) coexistence is governed, especially in relation to conflict management and resolution between different stakeholders.
Countries Visited	Switzerland, the Netherlands, the USA and France; mostly remote interviews conducted in the UK, Republic of Ireland and Belgium
Messages	A Reintroduction Coexistence Framework was developed to understand the context, management and governance of coexistence between potential large carnivore reintroductions and livestock farming in Britain and Ireland. Farming representatives were very sceptical about the concept, as well as about most management tools. However, there was some common ground with rewilding representatives about the centrality of governance. A series of five case studies illustrates the complexities.

EXECUTIVE SUMMARY

The potential reintroductions of wolves, lynx and bears to Britain and Ireland after absences of centuries, or even millennia, is one of the most controversial agri-environmental topics of the century. An application for a trial reintroduction of lynx in England was declined in 2018, with an unrelated project under discussion in Scotland. Yet with successful reintroductions of some non-carnivore species across these islands, from beavers to eagles, the idea is likely to grow in popularity and ambition. But despite the many social, economic and environmental benefits extolled by supporters of reintroductions, the costs and challenges are also significant, with many likely to be borne by livestock farmers. Few studies have considered their perspectives to date. On the other hand, there are numerous examples from around the world of large carnivore conservation successfully coexisting with a range of rural activities and stakeholders, including livestock farming. In multiple contexts, a wide variety of tools and methods are utilised to manage this coexistence with large carnivores, grouped into five main themes: deterrence, finance, force, enterprise and governance. In turn, these approaches, of which governance stands out as the most significant and important, influence and are influenced by various strategic factors. These include political, economic, social, technological, legal and environmental issues.

This study explored farmers' perspectives on the context, management and governance of coexistence between potential large carnivore reintroductions and livestock farming in Britain and Ireland through 10 interviews with agricultural and rewilding representatives. It also explored examples of coexistence from over 40 interviews in and/or visits to Switzerland, France, Belgium the Netherlands and the USA, which are presented as case studies. Finally, it developed a Reintroduction Coexistence Framework to encapsulate and visualise the varied dimensions of this topic.

In summary, large carnivore reintroductions are likely to be complex, contested and costly endeavours, whether with lynx, or, to an even greater extent, with wolves and bears. The primary challenge with all three species is likely to be the management and governance of coexistence with livestock farming, particularly of sheep. The qualitative findings from this report suggest that there is a degree of consensus, among both farming and rewilding representatives alike, about the scope and scale of these challenges, with both groups citing the varied political, economic, social, legal and environmental dimensions. However, agricultural interviewees were more likely to stress the potential negative consequences of reintroductions. Case studies from Switzerland, the Netherlands, Wyoming, Montana and Colorado illustrate the complexities in relation to deterrence, finance, force, enterprise and governance options respectively. Overall, the strategic context for potential large carnivore reintroductions to Britain and Ireland is currently extremely challenging.

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Chapter 1 - Introduction

1.1 Personal introduction



Figure 1: Jonny Hanson

Based in Northern Ireland, Jonny works at the intersection of conservation, agriculture and enterprise. Raised between Monaghan, Ireland, and Malawi, Africa, he spent summer holidays working on the farms of family and friends, and university summers working with wild animals of all sorts, including wolves and lynx. Following a PhD at the University of Cambridge on coexistence between snow leopard conservation, livestock farming and tourism in the Nepal Himalaya, Jonny became an Associate of the Snow Leopard Conservancy, an international conservation NGO.

Between 2014 and 2022, Jonny established and then managed Jubilee Farm, Northern Ireland's first community-owned farm, successfully integrating community-supported agriculture, care farming and conservation. In 2019, he was awarded Social Enterprise Northern Ireland's inaugural Young Social Entrepreneur of the Year award, while Jubilee Farm won the 'One to Watch' category. From 2022-4 Jonny co-led the Co-op Foundation-funded Cultivating Community Farming accelerator project, mentoring 10 early-stage community farming projects across Northern Ireland, as well as working on several consultancy, communications and business projects of his own.

Neutral on the subject of large carnivore reintroductions to Britain and Ireland, Jonny nevertheless has a keen personal and professional interest in the topic. He is particularly passionate about making a balanced and meaningful contribution to the debate that informs and benefits all stakeholders. His practical experience in agriculture, enterprise and conservation is enhanced by his academic training in history and archaeology (BA); business management and sustainability (MSc); and conservation and rural development (PhD).

Jonny is currently a Research Fellow in the ARK social policy hub at Queen's University Belfast.

1.2 Study introduction

1.2.1 Context

Few creatures have the emotive power that large carnivores have, as both our evolutionary past and our more recent catalogue of fairy tales attest (Hanson, 2023; 2025). For this reason, the potential reintroductions of Eurasian lynx *Lynx lynx*, grey wolves *Canis lupus*, and brown bears *Ursus arctos* to Britain and Ireland after absences of centuries or millennia is one of the most controversial agri-environmental topics of the century. An application for trial reintroductions of lynx in England was declined in 2018 (Natural England, 2018), with an unrelated project, Lynx to Scotland, currently under discussion in Scotland (Bavin and McPherson, 2022). Yet with successful reintroductions of some non-carnivore species across these islands, from beavers *Castor fiber* (Auster et al., 2022) to sea eagles *Haliaeetus albicilla* (NatureScot, 2020), the idea is likely to grow in popularity and ambition in the coming decades. This is part of a broader global trend towards rewilding (Blythe and Jepson, 2020) that has to be reconciled with various parallel global trends in agriculture, from, on one hand, increasing production and efficiency, to, on the other, reducing environmental externalities, especially in relation to the climate, water and biodiversity (Balmford, 2021). For a full discussion of all of the literature which underpins this section and this report, see Appendix A.

Despite the many social, economic and environmental benefits extolled by supporters of large carnivore reintroductions, the costs and challenges are also significant, with many likely to be borne by livestock farmers. Yet there are also numerous examples from around the world of large carnivore conservation successfully coexisting with livestock farming, as well as with a range of other rural activities, including forestry, tourism and hunting.

A wide variety of tools and methods are utilised to manage this coexistence between livestock farming and large carnivore conservation, grouped into five main themes (for full definitions of all terms used below, see the footnotes in Appendices C and D):

- Deterrence: fences and corrals; protective collars; livestock guardian animals; expanded husbandry practices e.g. shepherds, rangeriders.
- Force: hazing; translocation; lethal control.
- Finance: insurance; compensation; proactive payments, e.g. environmental performance payments.
- Enterprise: tourism; hunting; certification, e.g. predator-friendly livestock certification.
- Governance: guidelines and frameworks; stakeholder forums and conflict resolution mechanisms; spatial zoning.

In turns, these approaches, of which governance stands out as the most significant and important, are influenced by various strategic factors. These include political, economic, social, technological, legal and environmental issues. When combined with governance and management, these factors contribute to a 'Reintroduction Coexistence Framework' (Figure 2), created and proposed by this study as a model to encapsulate and visualise the varied dimensions of this topic.

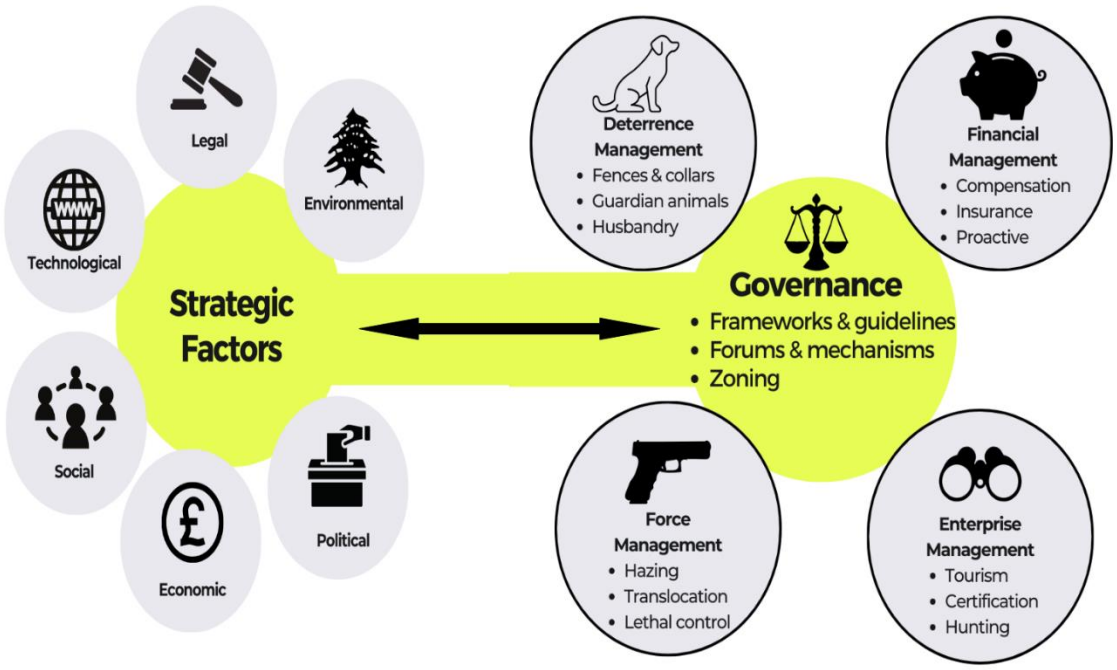


Figure 2: Reintroduction Coexistence Framework

1.2.2 Gaps and limitations

A growing number of studies have considered the environmental, and to a lesser extent social, feasibility of lynx and wolf reintroductions to Britain and Ireland. Limited attention, however, has been paid to farmers' perspectives on top predator reintroductions to either island, although a small number of qualitative and quantitative academic studies have been published recently (Bavin and MacPherson, 2022; Tan et al., 2024; Wilson and Campera, 2024). Even less attention has been paid to farmers' perspectives on the broad range of management tools which could be used to manage coexistence between livestock farmers, large carnivores and those who conserve them. There is therefore a clear need for an in-depth, qualitative exploration of farmers' perspectives on large carnivore reintroductions in Britain and Ireland, including towards the suite of potential management options available to stakeholders to manage – and govern – coexistence. In addition, a political ecology perspective (Robbins, 2019) is employed to consider how power dynamics and economic factors, among others, shape the context in which reintroductions are considered.

1.2.3 Research objectives and questions

Based on this review of the literature, the following broad research objectives and focused research questions were developed:

Objective 1: Explore farmers' perspectives

- What are farmers' perspectives towards the reintroduction of grey wolves, Eurasian lynx and brown bears to Britain and Ireland?
- What are farmers' perspectives towards the suite of management tools that could be used to manage coexistence in the event of reintroductions of any of these species?

Objective 2: Explore examples of coexistence

- How is coexistence between large carnivores, large carnivore conservationists, livestock farmers and other relevant stakeholders managed?
- How is this coexistence governed, especially in relation to conflict management and resolution between different stakeholders?

Chapter 2 – Methods

2.1 Britain and Ireland interviews

Between May and September 2023, remote interviews were conducted with representatives from the National Farmers' Union (NFU); NFU Cymru; NFU Scotland; the National Sheep Association (NSA); and the Irish Cattle and Sheep Farmers' Association (ICSA). For the purposes of triangulation, a number of rewilding organisations were also interviewed remotely over the same time period, including Rewilding Britain, Rewilding Ireland and Lynx to Scotland. A focus group was held in-person with the Ulster Farmers Union (UFU) in July 2023, and a short written submission was received from the Irish Farmers' Association (IFA) in August 2023. The interviews and focus group were semi-structured, following the questions of research objective one. Further information on the methodology is contained in Appendix B.

2.2 International interviews and visits

Between May and October 2023, in-person interviews were conducted with a broad range of stakeholders across three primary countries – Switzerland, the Netherlands and the USA – and one secondary country - France. Two remote interviews were also conducted during this same time period, one with a representative from AGRIDEA in Switzerland and one with a representative from COPA-COGECA in Belgium. See the acknowledgments section for a full list of those interviewed and visited. The interviews and focus group were mostly semi-structured, following the questions of research objective two. During, before and/or after many of the interviews, informal observations and discussions also took place across a wide variety of settings, including farms, ranches, National Parks, nature reserves, universities and governmental organisations, among others. Further information is also contained in Appendix B.

Chapter 3 – Farmers' perspectives on large carnivore reintroductions to Britain and Ireland

3.1 Overview

' I don't want to see any of them' – Farming representative

As part of this study's Reintroduction Coexistence Framework (RCF – see Figure 2), a PESTLE analysis was used to order the differing perspectives of agricultural and rewilding representatives about potential large carnivore reintroductions to Britain and Ireland. These included political, economic, social, legal and environmental aspects. Technological dimensions were not mentioned by any interviewees in this section. Overall, farming interviewees viewed lynx, then wolves and then bears in order of reintroduction likelihood and feasibility, but all with varying degrees of negativity. This supports similar recent quantitative findings (Tan et al., 2024; Wilson and Campera, 2024). Most of the conversations focused on lynx, though several agricultural representatives suggested very large, fenced enclosures could make wolf reintroductions more likely, at the same time questioning the feasibility of such an approach.

3.2 Political

'Farmers feel...powerless, which makes them less willing to countenance further reintroductions...[and] vilified for expressing their concerns' – Farming representative

Several interviewees noted that farmers frequently felt that they had a lack of agency in reintroduction debates and processes. They also felt that once these processes were set in motion, they were very hard to stop. On the basis of this, one representative stated that a clear plan had to be in place prior to any trial reintroductions, including when to stop them if they were not working. A lack of trust in the role and ability of government to manage reintroductions was also raised, in part because of farmers' experience with a range of other species, including beavers, raptors and badgers (e.g. Auster et al., 2022).

3.3 Economic

'[Those] "Not Financially Affected" are the people talking about this and being listened to' – Farming representative

Farming and rewilding representatives alike noted the uncertain and systemic shifts in agricultural policy, both post-Brexit and into the coming decades. This included overhauls to subsidy systems, as well as land-use changes in upland areas especially, trends widely discussed in the literature (de Boon et al., 2022; O'Rourke, 2019). Some farming representatives voiced doubt over consumers' willingness to pay for environmental goods in general, while at the same time desiring that farming contribute to them. Other farming representatives questioned whether reintroductions represented good value for money.

3.4 Social

'Farmers are under the cosh on a range of issues' – Farming representative

The potential for large carnivore reintroductions to cause stress to farmers was cited by a number of farming interviewees. The impact of dog worrying on sheep farming was mentioned as a relevant current example (e.g. NSA, 2023). Another agricultural representative questioned whether members of the public who could not control their dogs, or behave safely around livestock, could safely deal with big predators in the countryside.

3.5 Legal

'Bring the farmers with you; respect them instead of lecturing them' – Farming representative

The legal status of reintroduced large carnivores was referenced by multiple agricultural interviewees. Frequently mentioned in parallel was the legal status of management options. Convery et al. (2023), writing from a pro-wolf-reintroduction perspective, also suggest there is a significant degree of legal uncertainty surrounding these issues in the UK.

3.6 Environmental

'Marginal lands can't be dominated by subsidy-led sheep production that is mostly for export' – Rewilding representative

The environmental aspects of returning large carnivores to Britain and Ireland were the most discussed element overall, as befits the primary argument for their return (Convery et al., 2023). Rewilding representative stressed the transformative potential of apex predators in restoring ecosystems, tackling the climate and biodiversity crises in tandem, and managing deer populations (White et al., 2015; Bavin et al., 2023). Farming representatives had mixed views on the need for, or feasibility of this method of, deer control. They also questioned whether there was sufficient habitat or prey available in contemporary landscapes for large carnivores. In turn, they queried their potential knock-on effects on other protected species, and the animal welfare implications for both livestock and reintroduced animals alike. Lastly, both a rewilding and a farming representative agreed that there may be routes to achieving the same environmental outcomes that did not necessarily involve large carnivore reintroductions.

Chapter 4 – Managing coexistence between livestock farming and large carnivore reintroductions

4.1 Overview

'Money isn't always the issue; if you lose your female breeding sheep your flock is gone. It is also mentally difficult to lose animals.' - Farming representative

While the previous chapter considered farmers' perspectives on large carnivore reintroductions to Britain and Ireland, with some triangulation from rewilding representatives, this chapter considers how coexistence between the two processes could be managed. It considers the deterrence, finance, force and enterprise elements of the RCF (Figure 2), discussing them in relation to relevant literature. Chapter four also presents four short case studies, drawing on data from Switzerland, the Netherlands and the USA. Overall, agricultural interviewees were sceptical about the suite of potential management tools, citing their varying effectiveness, labour intensity and cost. Several rewilding interviewees suggested that many of the challenges of implementing deterrence approaches with lynx could be avoided by switching from farming sheep to cattle.

4.2 Deterrence

'There are cost and management implications for each type of husbandry response.' - Farming representative

Fences and night-time corrals were not deemed to be feasible logistically or viable economically. In addition, farming representative noted maintenance, public access and visibility issues with the former. Given that predators could target any area of a farm animal, with domestic dog attacks given as an example, neck collars were also deemed unsuitable. Very few interviewees mentioned the potential for donkeys or llamas as guardian animals, but guardian dogs were believed to require both expertise and expense. While improving human presence in the landscape was believed to be more effective as a deterrent, the cost and availability of suitable labour were raised as prohibitive barriers. These concerns with deterrence methods are consistent with similar assessments from both rewilding and agricultural organisations (NSA, 2016; Bavin and MacPherson, 2022).

4.3 Deterrence case study: mitigation measures in Switzerland

'Farmers are themselves split [on deterrence methods]...into various groups, from those who participate and see opportunities for new forms of land management...to those who see the management options as externally-imposed red tape and bureaucracy' – Swiss interviewee

Lynx were reintroduced to Switzerland from the 1970s, but, apart from some illegal killings due to hunters' concerns over their impact on roe deer *Capreolus capreolus* numbers, and a spike in sheep depredation in the 1990s, compensation, deterrence and the species' elusive nature minimised conflict over lynx (KORA, 2022). However, recolonisation – natural recovery - of the country by wolves,

particularly since 2018/19, has resulted in considerable conflict between stakeholders, especially in relation to livestock losses (e.g. KORA, 2020). The provision and training – but not labour - costs for deterrence methods, mainly electric fencing and livestock guardian dogs and to a lesser extent expanded shepherding practices, have been provided by the Swiss federal and cantonal governments. In 2020/21, of the four million Swiss francs spent on carnivore coexistence, three were spent on funding mitigation measures and advice, compared with CHF 172,500 on compensation payments (Swissinfo, 2021). AGRIDEA, an agricultural research and extension organisation, plays an important central role in coordinating training and research.



Figure 3: Livestock guardian dogs, Langwies, Switzerland

4.4 Finance

'*People who want lynx are the ones who are pushing these [financial] structures forward so the question becomes not how much or when, but by whom?*' - Rewilding representative

With financial tools overall, rewilding and farming representatives alike recognised their importance but also their challenges. These included: governance, delivery and funding mechanisms; long-term financial sustainability and security; and the limits of financial valuations for aspects of rural life and livelihood. Reactive compensation schemes were the most frequently mentioned. Practical problems included scheme verification and bureaucracy. Some farming representative felt that compensation normalised the problem of reintroduced predators while one rewilding representatives suggested these livestock losses could become 'just a managed part of life'. Rewilding interviewees were more likely to favour proactive payment approaches, potentially linked to broader payments for ecosystem services and/or with community elements. Only one interviewee mentioned insurance schemes and

noted the expense of up-front premiums for livestock. These concerns with financial methods have been noted both in the UK (NSA, 2016; Bavin and MacPherson, 2022) and globally (Ravenelle and Nyhus, 2017; Bautista et al., 2019).

4.5 Finance case study: compensation in the Netherlands

[The Dutch compensation scheme] 'is characterised [as]...top down rather than bottom up...reactive rather than proactive...bureaucratic rather than...efficient' – Dutch interviewee

Wolves have recolonised parts of the Netherlands over the last decade. A financial compensation scheme to compensate farmers for livestock losses to the species involved an element of co-design between stakeholders. However, financial pressures limited the amount of money available for compensation. In addition, this funding from came from existing agri-environmental subsidy funds, eliciting criticism from some agricultural stakeholders. Practically, although deterrence methods are not mandated in order to receive compensation, DNA testing is, leading to verification delays of 6-10 weeks. In the case of Richard and Stefana van de Wetering (Figure 4), who lost four sheep to a wolf in January 2022, despite Bij12, the relevant government agency, visiting them on the day the incident occurred, it took six months for partial compensation to be provided. Disputing the amount, a protracted court case ensued between the two parties. In 2021, €46,093 was paid in compensation for wolf-related losses in the Netherlands, although this has increased as the wolf population has expanded. Recent reforms have therefore increased the availability of funding (Interprovincial Overleg, 2023). However, this amount remains relatively small compared to the €36,741,834 paid by the Dutch government for agricultural damage by nine bird species and badgers in 2021 (Bij12, 2022).

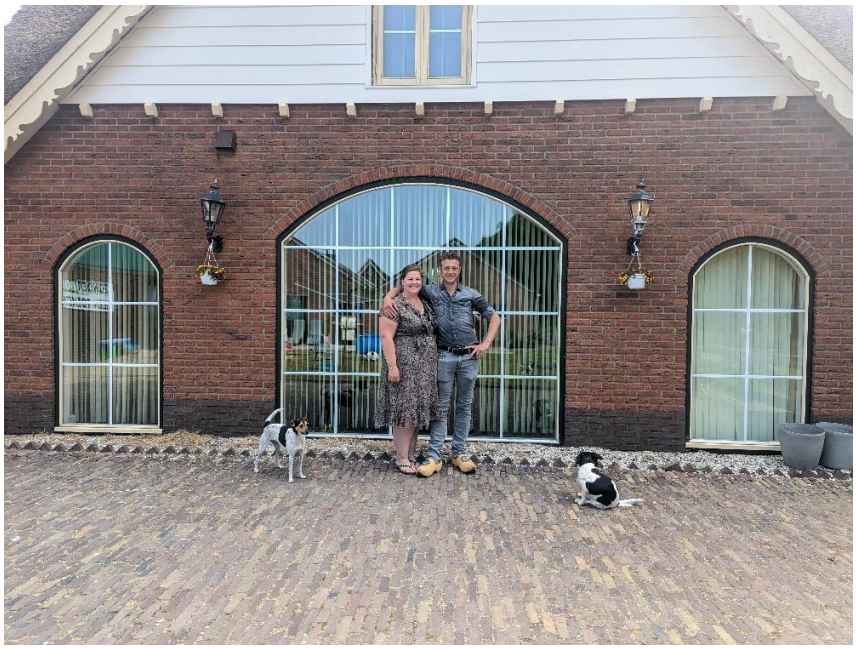


Figure 4: Richard and Stefana van de Wetering, Putten, the Netherlands

4.6 Force

'Without force, landowners will not be equipped psychologically to deal with large carnivores' – Rewilding representative

Almost all interviewees accepted that the use of force was a necessary management tool, particularly for problem animals. However, differences emerged over the issue of lethal control, between rewilding representatives who stressed it be employed as a last resort, and farming representatives, who were more willing to countenance it. All accepted that lethal control involved a range of challenges, including ethics, animal welfare, ecological impacts, licencing, expertise, cost, time, politicisation and public relations. The efficacy of translocation was questioned by several interviewees and none mentioned hazing as a potential management tool. The ethics and effectiveness of using force are similarly contested in the literature (Moreira-Arce et al., 2018; van Eeden et al., 2018A; Petracca et al., 2019; Thomas et al., 2023).

4.7 Force case study: the use of force in Wyoming

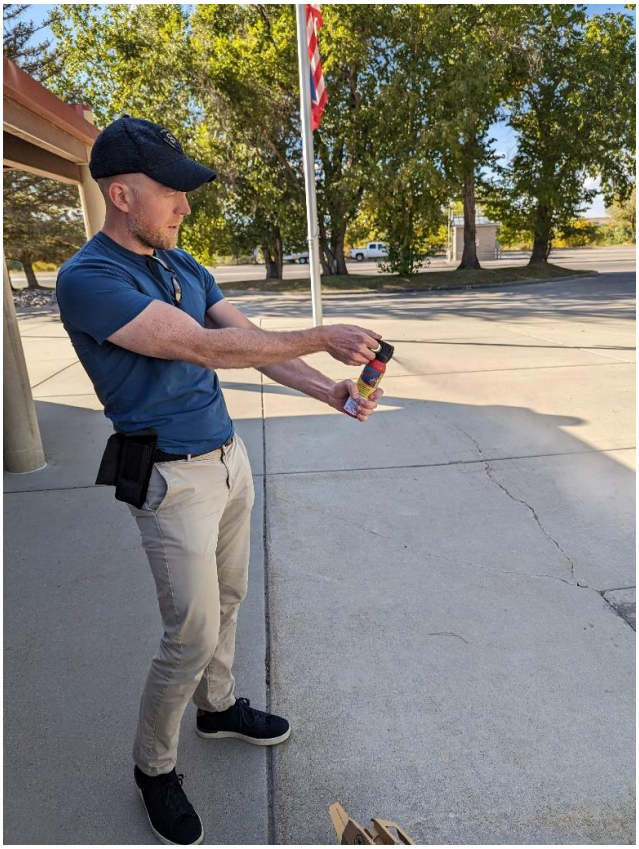


Figure 5: Bear spray training in Lander, Wyoming

'Force is a really important tool in keeping a species in a landscape' - Wyoming interviewee

Hazing, translocation and lethal control are carried out by various stakeholders in Wyoming, depending on the legal status and location of the predatory species. At the Simms Sheep Company, running c. 10,000 sheep and c. 700 breeding cows over private and public land in the south-western part of the state and adjoining parts of Utah, coyotes *Canis latrans* are shot and trapped, and eagle species translocated under licence, to minimise losses at and after lambing. Spatial zoning is used to regulate lethal control of wolves across the state. A central and coordinating role is played by the Wyoming Game and Fish Department's Large Carnivore team. They are permanently on call to respond to incidents involving large carnivores, people and livestock across the state, and integrate this with research on coexistence management, including extensive GPS collaring of wolves, bears and mountain lions *Puma concolor*.

4.8 Enterprise

'How can you have tourism if you can't see the animals?' - Farming representative

There was also a spilt between rewilding and agricultural interviewees in relation to the potential of enterprise approaches to coexistence. Though rewilding representatives were generally enthusiastic about the potential of wildlife tourism, while acknowledging the cryptic nature of lynx especially, farming representatives were more likely to question it, as noted in the Lynx to Scotland report (Bavin and MacPherson, 2022). Their concerns included that: it could be site specific; the novelty could wear off as new species became more common; it distracted from farming; it involved too much risk for farmers. The primary concern, however, was the mismatch between the costs of coexistence and the income from tourism, with sea eagles frequently cited as an example of this. While rewilding interviewees were more likely to remark on the ethical and ecological challenges of hunting as a potential tool, one agricultural interviewee queried how it could work in a landscape with a patchwork of small farms. Similarly, rewilding representatives were more likely to favour certification schemes, such as a hypothetical 'lynx-country lamb', while farming representatives were more sceptical, citing consumers' and supermarkets' limited willingness to pay for eco-labels. These are common themes in the literature on hunting (Bichel and Hart, 2023) and certification (Treves and Jones, 2010).

4.9 Enterprise case study: tourism and certification in Montana

'People want them [large carnivores] on the land...Landscapes are more alive and exciting with them present' – Montana interviewee



Figure 6: Group campground behind bear-proof electric fencing at Anderson Ranch, Tom Miner Basin, Montana

The Tom Miner Basin, adjoining Yellowstone National Park, has one of the highest concentrations of grizzly bears in North America. The five remaining ranches in the valley have created the Tom Miner Basin Association (TMBA) to cooperate on coexistence between carnivores and cattle ranching. These include education signs and talks for tourists at a popular bear viewing area. One of the TMBA members, Anderson ranch, also has individual holiday rentals, as well as a group campground for residential mediation and facilitation. Approximately 70 miles to the north, the Thirteen Mile Lamb and Wool Company in Belgrade previously pioneered predator-friendly certification for its wool. Consumers with an interest in people-predator coexistence paid a premium for their woollen products certified as 'Predator-Friendly' by the Wildlife Friendly Enterprise Network (WFEN, 2024). In key landscapes like these, conservation and agricultural easements stand out as innovative financial tools to minimise creeping development pressures, maintaining the landscape's value for wildlife, farming and tourism, while simultaneously providing income for landowners by selling development rights in perpetuity to land trusts (LTA, 2024; Vital Ground, 2024).



Figure 7: Livestock guardian donkey at Thirteen Mile Lamb and Wool, Belgrade, Montana

Chapter 5 – Governing coexistence between livestock farming and large carnivore reintroductions

5.1 Overview

'If we are to restore nature and tackle climate change at the level we need to, we can't please everyone' – Rewilding representative

Chapter four assessed farmers' opinions on the range of tools that could be used to manage coexistence between livestock farming and large carnivore reintroductions, building on chapter three's overview of general perspectives on the issue. Chapter five explores farmers' points of view on the approaches available to govern coexistence. These include frameworks, guidelines, forums, mechanisms and zoning (Figure 2). A case study from Colorado is also presented. Overall, governance was recognised as critically important by all interviewees. However, concerns were again raised about the role and ability of government in any reintroduction process. Furthermore, the prospect of reintroductions being forced through without farmers' consent elicited some commentary on the nature and limits of democracy, while a rewilding representative noted that while it was important to 'convince as many as possible...it was never possible to have everyone on board'. A potential rural/urban split on the issue was highlighted by some interviewees, while others acknowledged the significance of underlying values and beliefs to the overall reintroduction concept. These issues are commonly encountered in other coexistence governance contexts (Hodgson et al., 2020). Spatial zoning was only mentioned by one interviewee, in the context of the challenges of limiting reintroduced species to agreed trial areas.

5.2 Frameworks and guidelines

[For] '*illegal [lynx] reintroductions, there shouldn't be retrospective allowances...it is bound to happen if they keep getting rejected'* – Farming representative

At the national level, the importance of official guidelines governing reintroductions was noted by several farming representatives. It was felt, for example, that the recently established Species Reintroduction Taskforce (House of Commons, 2023) addressed a gap in governance frameworks of the process in England. Impact assessments that considered the short, medium and long term were also welcomed. At the local level, several interviewees highlighted the significance of consultations, a requirement echoed by the IUCN (2013) Guidelines. A lack of local consultation was a significant factor in the decision to withhold a licence from the Lynx UK Trust's proposed trial lynx reintroduction in Kielder Forest (Natural England, 2018). Unsurprisingly, licencing was also noted as a crucial governance requirement by some interviewees.

5.3 Forums and mechanisms

'*What powers do [local stakeholder forums]...have? They need backing to deliver what's needed.'* - Farming representative

Locally mandated, empowered and resourced governance approaches that included a wide cross-section of stakeholders were broadly welcomed by most rewilding and farming representatives alike. However, a number of challenges were noted. Firstly, one agricultural interviewee stated that participating in governance groups, at any level, could be seen as giving approval to the reintroduction process. Secondly, one rewilding interviewee felt that positions in such forums were hardened when members represented stakeholders' groups as opposed to participating as individuals. This is a trend noted by Rust (2017) and Carter et al. (2020) in other coexistence contexts. Thirdly, one farming representative noted the importance of neutral mediators to facilitate such governance structures, including addressing conflicts within them.

5.4 Governance case study: wolf reintroduction in Colorado

'In general, people want large carnivores like wolves but don't want to pay for them' – Colorado interviewee



Figure 8: Anti-wolf reintroduction sign on a ranch outside Walden, Colorado

Following a successful reintroduction of Canadian lynx *Lynx canadensis* to Colorado between 1996 and 2006, support for the reintroduction of grey wolves increased. This resulted in a successful ballot initiative in 2020 – Proposition 114 - with 50.9% of c. 3 million votes cast in favour of reintroducing wolves to the more sparsely-populated western part of the state. Colorado Parks and Wildlife (CPW), the state agency responsible for conservation, was tasked with implementing this project. Various consultation processes were conducted, including with key stakeholders, key individuals and the general public, resulting in the Colorado Wolf Restoration and Management Plan (CPW, 2023). Colorado State University's (CSU) Centre for Human-Carnivore Coexistence (CHCC) was also involved in researching the process and planning for technical support for ranchers. This included the creation of a multi-stakeholder Wolf Conflict Reduction Group and associated rapid-response fund (CSU, 2023). A key part of the governance process was designating the reintroduced wolf population as a '10(j)' experimental one to allow for more flexible management. Yet, despite the participatory nature of the

consultation and governance process, the reintroduction of wolves to Colorado has highlighted considerable political and geographical divisions.

Chapter 6 – Conclusions and recommendations

'Will solving a deer management problem by these reintroductions [to Britain or Ireland] create another and more complex problem in its place?' - Dutch interviewee

6.1 Conclusions

This report analysed farmers', and to a lesser extent rewilders', perspectives on large carnivore reintroductions to Britain and Ireland, and on management and governance options, through a Reintroduction Coexistence Framework (Figure 2). In summary, these proposals are likely to be complex, contested and costly endeavours, whether with lynx, or, to an even greater extent, with wolves and bears. The primary challenge with all three species is likely to be the management and governance of coexistence with livestock farming, particularly of sheep. The qualitative findings from this report suggest that there is a degree of consensus, among both farming and rewilding representatives alike, about the scope and scale of these challenges, with both citing the varied political, economic, social, legal and environmental dimensions. However, agricultural interviewees were more likely to stress the potential negative consequences of reintroductions. This complements the limited quantitative findings on this topic (Hawkins et al., 2020; Tan et al., 2024; Wilson and Campera, 2024). Overall, the strategic context for potential large carnivore reintroductions to Britain and Ireland is currently extremely challenging, corresponding with the Lynx to Scotland social feasibility study's conclusions (Bavin and MacPherson, 2022).

In terms of the first two management tools available to manage coexistence – deterrence and finance - agricultural representatives were generally sceptical about their use, citing their varying effectiveness, as well as labour intensity and cost for the former. There was some consensus among all interviewees that the use of force would be an essential management tool, but disagreement over the flexibility of its deployment, especially of lethal control. While acknowledging the limitations for tourism of lynx's elusive nature, rewilding representatives were more likely to emphasise the potential benefits from this approach, while farming representatives were concerned about the allocation of benefits from tourism to landowners bearing the costs. Previous reports from various perspectives have raised similar concerns about the practical application of management tools (NSA, 2016; Bavin and MacPherson, 2022). There was, however, a greater degree of consensus on the importance of coexistence governance approaches, including frameworks, guidelines, licenses, forums and mechanisms, echoing Auster et al's (2022) research from coexistence with beaver reintroductions in England.



Figure 9: Summary word cloud

6.2 Recommendations

6.2.1 Specific conservation translocation guidelines for Wales, Northern Ireland and the Republic of Ireland should be consulted on and developed by the relevant government agency, complementing those already in place for Scotland and England.

6.2.2 Alternatives to large carnivore reintroductions that achieve similar environmental outcomes, especially through the control of deer populations, should be actively considered and explored by all parties.

6.2.3 More thorough, in-depth and independent cost-benefit analyses, that also consider the costs of training and equipping farmers in deterrence methods, should be commissioned by rewilding, agricultural and other organisations to address this information gap.

6.2.4 More research should be conducted into the creation and implementation of innovative financial tools that could be used to ensure the costs of coexisting with carnivores are rebalanced towards those who desire their return, including conservation easements and a Payments to Encourage Coexistence fund (Dickman et al., 2011; Figure 9).

6.2.5 Additional research to address the primary gap in this study's analysis – technological factors and spatial zoning – should be conducted to assess the feasibility of utilising technological tools to zone landscapes more effectively.

6.2.6 Consideration by all stakeholders should be given to the organisational structures and capacity required to effectively manage and govern coexistence between large carnivore reintroductions and livestock farming. A particular focus should be on organisations that effectively combine research and

practice in this area, including AGRIDEA in Switzerland, the Wyoming Game and Fish Department, and Colorado State University's Centre for Human-Carnivore Coexistence.

6.2.7 Especially in locations where large carnivore reintroductions have been, are or will be considered, independently-facilitated governance forums should be created or expanded to build trust between all stakeholders, through, for example, multi-stakeholder study visits to the likes of Switzerland, the Netherlands and the USA.

6.2.8 Technical advisory groups for potential reintroduction projects should greatly expand the representation of experts in the social sciences and humanities, to complement expertise in the natural sciences.

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Appendix A – Technical literature review

Habitat suitability for lynx reintroductions has been assessed as 20,678km^2 in Scotland (Hetherington and Gorman, 2007), 11,369km^2 in the rest of Britain (Johnson and Greenwood, 2020) - albeit with a degree of overlap in the Scottish Southern Uplands between these two studies – and 4,488km^2 in Ireland (Guilfoyle et al., 2023). However, in Ireland, a single archaeological remain from a disturbed site also raises questions about the nativity of the species on the island (Woodman et al., 1997). Overall, the various authors concluded that only in Scotland, Thetford and Kielder forests, and an area of Southeast England, would there be sufficient habitat quantity and quality to sustain viable long-term lynx populations: of up to 400 in the Scottish Highlands (Hetherington and Gorman, 2007 and of up to 256 in the rest of Britain (Johnson and Greenwood, 2020). For wolves, Gwynn and Symeonakis (2022) projected between 10,139km^2 and 18,857km^2 of suitable habitat in Scotland that could support from 50 to 94 packs of four animals. In Ireland, Murphy et al. (2023) estimated habitat suitability at 652km^2 in four of its national parks but did not specify habitat suitability beyond these or estimate the carrying capacity for wolves. To date, no studies appear to have considered habitat suitability for bears on either island.

Various studies and polls have also considered the social feasibility of large carnivore reintroductions, though in Britain only and mainly for lynx. A YouGov poll found that while only 24% of 2083 respondents wanted bears reintroduced, 36% supported lynx and wolf reintroductions (Pheby, 2020). For lynx specifically, other surveys have found 52% and 49% in favour of - and 19% and 21% opposed to - a trial lynx reintroduction in Scotland (Rewilding Britain, 2021) and the UK (Smith et al., 2016). The primary concern about lynx reintroductions was the potential risks to farming, while the main benefits cited were for tourism, forestry and biodiversity (Hawkins et al., 2020; Bavin et al., 2023; Wilson and Campera, 2024). However, rural and agricultural communities were less supportive of lynx reintroductions. Smith et al. (2016) noted that 60% of respondents from agricultural backgrounds were opposed to lynx reintroductions, while Wilson and Campera (2024) found that 70% of farmers surveyed were strongly opposed to the idea. Similarly, in what appears to be the first quantitative study to focus solely on farmers' perspectives on lynx reintroductions, Tan et al. (2024) observed negative attitudes towards the concept overall, as well as widespread intentions to cull the species in the event of a reintroduction. These proposals also take place in the context of uncertain and systemic shifts in agricultural policy and land-use, especially in upland areas (de Boon et al., 2022; O'Rourke, 2019).

Elsewhere, in Europe and globally, a range of tools are used to manage coexistence between livestock farming and large carnivore conservation. Deterrence is the first of these, and can include fences, sometimes with additional sensory elements, such as fladry or Foxlights; corrals or night fences; protective collars; guardian animals, typically dogs, llamas or donkeys; and expanded husbandry practices carried out by professionals, such as shepherds or rangeriders. They all work by disrupting the attack sequence of a predator on livestock (Linnell et al., 2012). However, there is often a lack of available evidence on the respective efficacies of the various deterrence methods, with successful approaches often species- or context-specific (Moreira-Arce, D., et al. 2018; van Eeden et al., 2018A; van Eeden et al., 2018B). Even with deterrence methods

in place, Murphy et al's (2023) Agent-Based Model simulation of wolf reintroductions to four of Ireland's national parks projected that livestock losses would be reduced but not avoided entirely. Similarly, Bavin and MacPherson (2022) found little interest among Scottish stakeholders in the use of fencing or guardian animals as deterrence methods.

Financial tools are the next coexistence approach. These usually involve compensation, insurance or proactive/environmental performance-type payments for actual or likely livestock losses paid at the individual and/or community level (Dickman et al., 2011; Figure 9). To minimise moral hazard – where the presence of financial compensation reduces the incentive to minimise livestock losses through deterrence – varying degrees of verification are required (Bulte and Rondeau, 2005). However, these can often lead to bureaucratic delays; in one global review, 75% of negative comments about compensation schemes related to programme administration (Ravenelle and Nyhus, 2017). In their review of European deterrence and compensation schemes, Bautista et al. (2019) noted that, while preventative methods should be prioritised, only a few, wealthier countries paid for the additional costs associated with this. In a cost-benefit analysis of trial lynx reintroductions to Kielder and Thetford forests in England, compensation for sheep losses was estimated at between £0 and £5378 annually (White et al., 2015). However, the costs of training and equipping farmers to minimise predation incidents were not calculated. Furthermore, the National Sheep Association criticised both the proposed compensation and mitigation measures as inadequate (NSA, 2016).

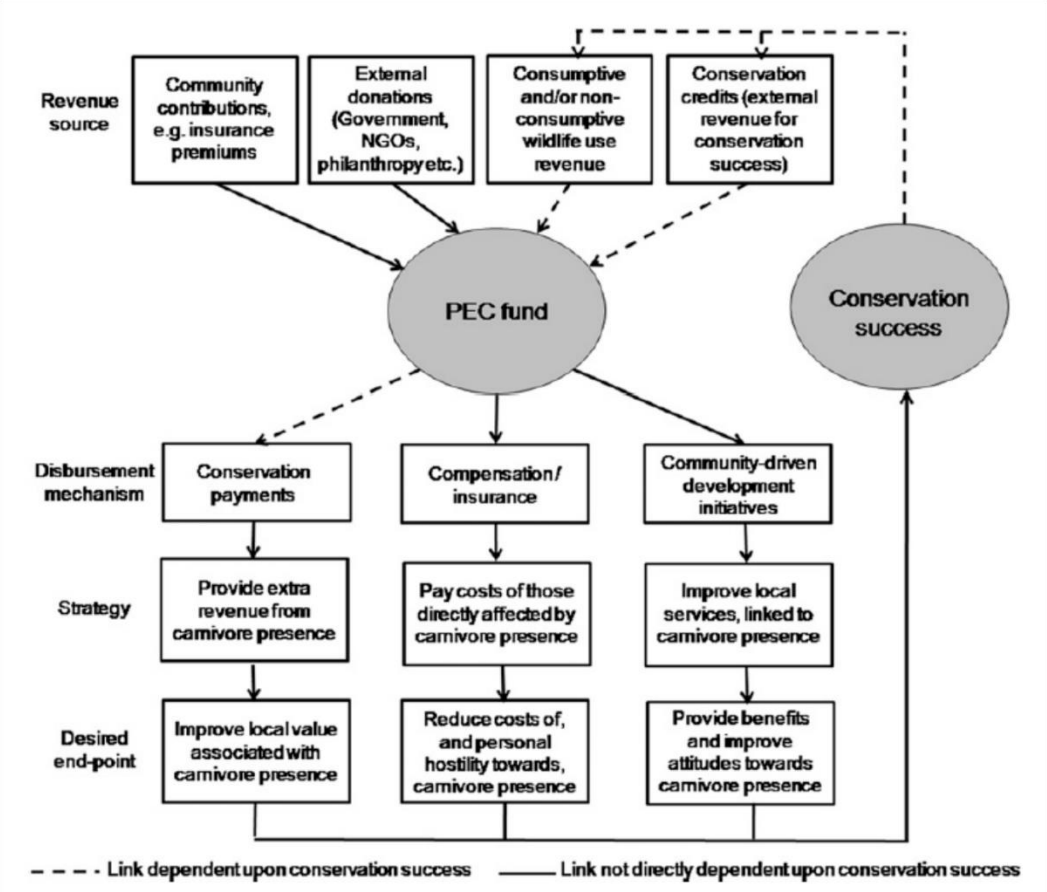


Figure 10: Payments to encourage coexistence fund (Dickman et al., 2011)

The third type of coexistence tool is the use of force. This includes hazing, translocation and lethal control. Hazing is defined as 'making use of a range of deterrents including lighting, sound, odours, or non-lethal projectiles to discourage animals from a particular area or behaviour' (Hodgson et al., 2020). Like deterrence, hazing suffers from varying degrees of effectiveness, as well as a lack of empirical analyses (.e.g. Goodrich et al., 2011; Petracca et al., 2019). Similarly, with translocations, or the removal of problem animals, success rates can be low, as with conservation translocations in general (Massei et al., 2010; Fonturbel and Simonetti, 2011; Thomas et al., 2023). Thirdly, the effectiveness of lethal control is also debated (McManus et al., 2015; Moreira-Arce et al., 2018; van Eeden et al., 2018A), often accompanied by particularly complex and acute ethical dilemmas.

Enterprise approaches to carnivore coexistence are proactive methods that focus on the potential benefits of predators rather than the costs alone. First, tourism. Wildlife tourism is defined as 'the experiencing of wildlife by tourists' (Reynolds and Braithwaite, 2001). Wolf tourism in and around Yellowstone National Park after the 1995 reintroduction, for example, exceeded projections of US$27.7 millions, rising to US$35.5 million by 2005 and US$45.5 million over a decade later (Duffield, 2019). In their cost-benefit analysis of trial lynx reintroductions to Thetford and Kielder forests, White et al. (2015) estimated the tourism benefit to be £65.7 million over 15 years. No studies in Britain or Ireland appear to have projected the potential economic benefits of hunting reintroduced predators. As with the use of lethal control, this approach is often subject to

considerable ethical (Bichel and Hart, 2023) and ecological (e.g. Treves et al., 2019) debate. Thirdly, predator-friendly certification schemes aim to reallocate some of the costs of coexisting with carnivores from livestock farmers to sympathetic consumers. In practice, however, they are challenging to implement and sustain (Treves and Jones, 2010).

All of these technical coexistence tools attempt to minimise the impacts of large carnivores on humans and their activities, especially livestock farming. Nevertheless, none address the complex interplay of various strategic factors - social, political, economic, legal, technological and environmental - that usually underpin conflicts between human groups *over* large carnivores. For this, governance approaches are not only necessary but vital (Hodgson et al., 2020). In fact, it is this distinction between, on one hand, impacts on or by wildlife, and, on the other, conflict over these impacts between different stakeholder groups, that lies at the heart of a coexistence approach to conservation (Bhatia et al., 2020; Gao and Clark, 2023). An increasing number of wildlife and carnivore coexistence models therefore factor in social dimensions to the ubiquitous ecological drivers (Carter and Linnell, 2016; Ceausu et al., 2018; Carter et al., 2020).

However, coexistence approaches to address underlying social conflicts, through approaches like guidelines, frameworks, stakeholder forums, conflict resolution mechanisms and spatial zoning have been less common (Rust, 2017; Hodgson et al., 2020), though examples are now emerging (Lute et al., 2020; Marchini et al., 2021). Drawing on lessons from the governance of beaver reintroductions in England, Auster et al. (2022) propose a model of 'renewed coexistence', acknowledging the particular challenges of coexistence with reintroduced species. They recommend the coexistence process include: diverse views on trial reintroductions; monitoring and research; conflict management protocols; and stakeholder and public engagement. Also of relevance are: reintroduction – or conservation translocation – guidelines in place for both Scotland (National Species Reintroduction Forum, 2014) and England (DEFRA, 2021), themselves based on the IUCN Guidelines (2013); and DEFRA's recently-established 'England Species Reintroduction Taskforce' (House of Commons, 2023). Finally, Convery et al. (2023) provide an initial overview of the uncertain legal status of reintroduced wolves in the UK, which could be extrapolated to lynx or bears.

Appendix B – Technical methodology

Following a review of the literature (see Appendix A) and the drafting of the research objectives and questions (see section 1.2.3), a cross-sectional and case study approach with multiple methods was employed for the two sets of interviews and/or visits (Newing et al., 2011).

For the 10 Britain and Ireland semi-structured interviews, which also included one focus group and one short written submission, targetted sampling was used to intentionally select those most relevant to the study (Newing et al., 2011), in this case representatives from key agricultural and rewilding organisations across both jurisdictions. An interview guide (see Appendix C), with the research questions and key definitions of technical terms, was developed and shared with the participants in advance, as was a consent form (available on request), following King and Horrocks (2010). Following the same set of questions for all interviewees allowed between-subject triangulation to occur (Newing et al., 2011). All of the interviews were recorded and, immediately afterwards, a qualitative summary was made. Rather than coding of the entire transcript, the coded observations from these memos became the main form of analysis when integrated with the literature in the narrative results and discussion sections (chapters three to five).

For the 46 international interviews, the majority followed the same methodology described above for the Britain and Ireland interviews, with some snowball sampling utilised to access networks and interviewees within each country (King and Horrocks, 2010). However, 21 of these interviews also involved some form of participant observation, with the time spent with each individual ranging from several hours to several days (Newing et al., 2011). This ethnographic approach was sometimes conducted instead of a semi-structured interview and sometimes in addition to it. When the use of formal consent forms was not deemed appropriate, oral and/or subsequent written permission was obtained. As with the Britain and Ireland interviews, a qualitative summary was made immediately after the interview and/or participant observation. Similarly, these memos were employed as the primary form of analysis when coded, presented and discussed, alongside the relevant literature, as five case studies in chapters four and five. This provided perspectives on the actual implementation of coexistence and management approaches, complementing attitudes to the theoretical use of these approaches from British and Irish interviewees.

The rationale for visiting sites and projects in Europe and North America was the cultural, agricultural and regulatory similarities with Britain and Ireland. This therefore increased the validity and applicability of the case study findings (Newing et al., 2011). Furthermore, the three primary study locations were also chosen to reflect the diversity of nations, and political arrangements, within Britain and Ireland:

- Switzerland: small; crowded; federal; outside the EU; wolf recolonisation and lynx reintroductions of particular relevance.
- The Netherlands: small; crowded; centralised; within the EU; recolonisation of wolves over last 10 years of particular relevance.

- Mountain West, USA: large; sparsely populated; federal; reintroduction of wolves to Yellowstone National Park in 1990s and to Colorado in 2023, as well as prevalence of tourism, hunting and predator-friendly certification schemes, of particular relevance.

Appendix C – Britain and Ireland interview questions and definitions

Research project title: **Large carnivore reintroductions to Britain and Ireland: farmers' perspectives and management options**	NUFFIELD Farming Scholarships
Principal Investigator: **Jonny Hanson, PhD**	

Research question 1A: What are farmers' perspectives towards the reintroduction of grey wolves, Eurasian lynx and brown bears to Britain and Ireland?

Name: Eurasian Lynx (*Lynx lynx*)

Weight: 8 - 36 kg

Habitat: Evergreen and deciduous forests

Range: 20 - 450 km^2

Social Preference: Solitary

Relative risk to humans: Low

Dietary preferences: Roe-sized deer



Eurasian Lynx. Jon Glittenberg. CC A-SA 4.0

Name: Grey Wolf (*Canis lupus*)

Weight: 23 - 80 kg

Habitat: Temperate forests, mountains, tundra, taiga, grasslands and deserts

Range: 189 - 2590+ km^2

Social Preference: Pack

Relative risk to humans: Low - Medium

Dietary preferences: Deer-sized large mammals



Grey wolf. Mas3cf. CC A-SA 4.0

Name: Eurasian Brown Bear (*Ursus arctos*)

Weight: 150 - 300 kg

Habitat: Mountains, woodland

Range: 120 - 1600 km^2

Social Preference: Solitary

Relative risk to humans: Medium – High

Dietary preferences: Wide variety of plants and animals



Research question 1B: What are farmers' perspectives towards the suite of management tools that could be used to manage coexistence in the event of reintroductions of any of these species?

1. Husbandry

Fences: Physical barriers separating livestock and/or crops, commonly barbed or electrified.[1]

Collars: Worn by livestock, sometimes with bells to alert shepherds or guard animals to predator threats, and often with studded leather to prevent attacks in action[2], or can be applied with shocks to predator animals when entering certain boundaries or attacking livestock.[3]

Shepherds: Direct human management and supervision of livestock.[4]

Guard animals: Usually dogs, but sometimes llamas or donkeys, and especially effective at deterring solitary species.[5]

Corrals: Enclosed structures, often roofed, for holding livestock, particularly at night.[6]

2. Force

1Hodgson et al. (2020) *The State of Knowledge and Practice on Human-Wildlife Conflicts.* The Luc Hoffman Institute. Found online at: [https://luchoffmanninstitute.org/wp-content/uploads/2020/03/LucHoffmannInstitute-humanwildlifeconflict-web.pdf] – LHI.

2 Khorozyan et al. (2020) "Studded leather collars are very effective in protecting cattle from leopard (Panthera pardus) attacks" in *Ecological Solutions and Evidence* 1:1, e12013. Found online at: [https://besjournals.onlinelibrary.wiley.com/doi/full/10.1002/2688-8319.12013]

3Littlewood, N.A. (2020) "Deter predation of livestock by using shock/electronic dog-training collars to reduce human-wildlife conflict". Found online at: [https://www.conservationevidence.com/actions/2446]

4 LHI (p.11)

5 LHI (p.11)

6 Watts, S.M. *Corrals: From Conception to Construction.* Found online at: [https://panthera.org/blog-post/corrals-conception-construction]

Hazing: Making use of a range of deterrents including lighting, sound, odours, or non-lethal projectiles to discourage animals from a particular area or behaviour.[7]

Translocation: The removal of an animal from the area in which it is causing harm, directly removing threat to lives and livelihoods.[8]

Culling: Regulated, targeted killing of problem animals, as well as more general regulated killing to reduce populations and therefore potential damage.[9]

3. Finance

Compensation: Damages in the form of monetary payments, livestock replacement, or tax relief for losses to predation.[10]

Insurance: Similar to compensation schemes, but often more community-driven and requires the paying of premiums by livestock owners, usually per head of livestock.[11]

Environmental performance payments: Proactive payments for the preservation of a species and/or their occurrence on a landowner's property, rather than for damages incurred.[12]

4. Enterprise

Tourism: Wildlife tourism can be either consumptive, such as hunting and fishing, or non-consumptive, focusing on viewing and interacting with animals in their natural habitats, such as boat trips and vehicle safaris.[13]

Sport hunting: Paid and permitted hunting that may raise funds for local conservation and/or rural development, while also, potentially, performing a population control role.[14]

Certification schemes: Ecolabels allow sustainable practices to be recognised by consumers in return for a premium being paid to producers, but have varying standards and credibility. A relevant example is Predator Friendly®, which requires verification that no predators have been killed in the production of animal products, thereby allowing farmers to sell that produce at a premium.[15][16]

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7 LHI (p.9)

8 LHI (p.8)

9 LHI (p.8)

10 Dickman, A.J., MacDonald, E.A. and MacDonald, D.W. (2010) "A review of financial instruments to pay for predator conservation and encourage human–carnivore coexistence" in *PNAS* 108:34.

11 Ibid (p.3-5)

12 Ibid (p.5)

13 Treves, A. and Jones, S.M. (2010) "Strategic tradeoffs for wildlife-friendly eco-labels" in *Frontiers of Ecology and the Environment* 8:9, 451-504.

14 LHI (p.13-14)

15 Newsom, D., Dowling, R.K. and Moore, S.A. (2005) *Wildlife Tourism.* Channel View Publications.

16 Predator Friendly (2013) *Predator Friendly® Production Standards.* Found online at: [https://wildlifefriendly.org/wp-content/uploads/2015/09/predator-friendly-standards-final-2013-v1-0.pdf]

5. Governance

Legal: Includes codes of conduct, standards, memorandums, declarations of interest, and acts of law at regional, national, or international level.[17]

Stakeholder forums: Participatory processes, such as workshops, interviews, focus groups, or consultations, that provide a neutral platform for various, often conflicting, interests to engage one another in dialogue. A relevant example is the National Sea Eagle Stakeholder Panel in Scotland.[18]

Conflict resolution mechanisms: Means of negotiation to settle disputes between stakeholders either directly or through a formal mediator who will facilitate discussions, to avoid legal court action.[19]

17 Loveridge, A.J. (2006) "Does sport hunting benefit conservation?" in *Key Topics in Conservation Biology* [Found online at: https://www.researchgate.net/publication/252259835_Does_sport_hunting_benefit_conservation/citation/download]

18 NatureScot (2020) *Wildlife Management - A shared approach.* Found online at: [https://www.nature.scot/doc/wildlife-management-shared-approach-concordat

19 Oklahoma Bar Association (2019) *Methods for Resolving Conflicts and Disputes.* Found online at: [https://www.okbar.org/freelegalinfo/disputes/#:~:text=Negotiation%2C%20mediation%20and%20arbitration%2C%20often,these%20processes%20should%20be%20considered.]

Appendix D – International interview questions and definitions

Research project title: **Large carnivore reintroductions to Britain and Ireland: farmers' perspectives and management options**	NUFFIELD Farming Scholarships
Principal Investigator: **Jonny Hanson, PhD**	

Research question 2A: How is coexistence between large carnivores, large carnivore conservationists, livestock farmers and other relevant stakeholders managed?

1. Husbandry

Fences: Physical barriers separating livestock and/or crops, commonly barbed or electrified.[20]

Collars: Worn by livestock, sometimes with bells to alert shepherds or guard animals to predator threats, and often with studded leather to prevent attacks in action[21], or can be applied with shocks to predator animals when entering certain boundaries or attacking livestock.[22]

Shepherds: Direct human management and supervision of livestock.[23]

Guard animals: Usually dogs, but sometimes llamas or donkeys, and especially effective at deterring solitary species.[24]

Corrals: Enclosed structures, often roofed, for holding livestock, particularly at night.[25]

2. Force

20 Hodgson et al. (2020) *The State of Knowledge and Practice on Human-Wildlife Conflicts.* The Luc Hoffman Institute. Found online at: [https://luchoffmanninstitute.org/wp-content/uploads/2020/03/LucHoffmannInstitute-humanwildlifeconflict-web.pdf] – LHI.

21 Khorozyan et al. (2020) "Studded leather collars are very effective in protecting cattle from leopard (Panthera pardus) attacks" in *Ecological Solutions and Evidence* 1:1, e12013. Found online at: [https://besjournals.onlinelibrary.wiley.com/doi/full/10.1002/2688-8319.12013]

22 Littlewood, N.A. (2020) "Deter predation of livestock by using shock/electronic dog-training collars to reduce human-wildlife conflict". Found online at: [https://www.conservationevidence.com/actions/2446]

23 LHI (p.11)

24 LHI (p.11)

25 Watts, S.M. *Corrals: From Conception to Construction.* Found online at: [https://panthera.org/blog-post/corrals-conception-construction]

Hazing: Making use of a range of deterrents including lighting, sound, odours or non-lethal projectiles to discourage animals from a particular area or behaviour.[26]

Translocation: The removal of an animal from the area in which it is causing harm, directly removing threat to lives and livelihoods.[27]

Culling: Regulated, targeted killing of problem animals, as well as more general regulated killing to reduce populations and therefore potential damage.[28]

3. Finance

Compensation: Damages in the form of monetary payments, livestock replacement, or tax relief for losses to predation.[29]

Insurance: Similar to compensation schemes, but often more community-driven and requires the paying of premiums by livestock owners, usually per head of livestock.[30]

Environmental performance payments: Proactive payments for the preservation of a species and/or their occurrence on a landowner's property, rather than for damages incurred.[31]

4. Enterprise

Tourism: Wildlife tourism can be either consumptive, such as hunting and fishing, or non-consumptive, focusing on viewing and interacting with animals in their natural habitats, such as boat trips and vehicle safaris.[32]

Sport hunting: Paid and permitted hunting that may raise funds for local conservation and/or rural development, while also, potentially, performing a population control role.[33]

Certification schemes: Ecolabels allow sustainable practices to be recognised by consumers in return for a premium being paid to producers, but have varying standards and credibility. A relevant

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26 LHI (p.9)
27 LHI (p.8)
28 LHI (p.8)
29 Dickman, A.J., MacDonald, E.A. and MacDonald, D.W. (2010) "A review of financial instruments to pay for predator conservation and encourage human–carnivore coexistence" in *PNAS* 108:34.
30 Ibid (p.3-5)
31 Ibid (p.5)
32 Treves, A. and Jones, S.M. (2010) "Strategic tradeoffs for wildlife-friendly eco-labels" in *Frontiers of Ecology and the Environment* 8:9, 451-504.
33 LHI (p.13-14)

example is Predator Friendly®, which requires verification that no predators have been killed in the production of animal products, thereby allowing farmers to sell those products at a premium.[34][35]

Research question 2B: How is this coexistence governed, especially in relation to conflict management and resolution between different stakeholders?

Governance

Legal: Includes codes of conduct, standards, memorandums, declarations of interest, and acts of law at regional, national, or international level.[36]

Stakeholder forums: Participatory processes, such as workshops, interviews, focus groups, or consultations, that provide a neutral platform for various, often conflicting, interests to engage one another in dialogue. A relevant example is the National Sea Eagle Stakeholder Panel in Scotland.[37]

Conflict resolution mechanisms: Means of negotiation to settle disputes between stakeholders either directly or through a formal mediator who will facilitate discussions, to avoid legal court action.[38]

34 Newsom, D., Dowling, R.K. and Moore, S.A. (2005) *Wildlife Tourism.* Channel View Publications.

35 Predator Friendly (2013) *Predator Friendly® Production Standards.* Found online at: [https://wildlifefriendly.org/wp-content/uploads/2015/09/predator-friendly-standards-final-2013-v1-0.pdf]

36 Loveridge, A.J. (2006) "Does sport hunting benefit conservation?" in *Key Topics in Conservation Biology* [Found online at: https://www.researchgate.net/publication/252259835_Does_sport_hunting_benefit_conservation/citation/download]

37 NatureScot (2020) *Wildlife Management - A shared approach.* Found online at: [https://www.nature.scot/doc/wildlife-management-shared-approach-concordat

38 Oklahoma Bar Association (2019) *Methods for Resolving Conflicts and Disputes.* Found online at: [https://www.okbar.org/freelegalinfo/disputes/#:~:text=Negotiation%2C%20mediation%20and%20arbitration%2C%20often,these%20processes%20should%20be%20considered.]



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