Biological Conservation 310 (2025) 111380

Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon

Stakeholder solutions to human-wildlife conflicts: Co-created adaptive impact management for wild red deer, *Cervus elaphus*, in the English Lake District

Thomas William Logan [a,*], Alastair Iain Ward [a], Charlotte Rachael Hopkins [b]

[a] School of Biology, University of Leeds, Leeds LS2 9JT, UK
[b] School of Environmental and Life Sciences, University of Hull, Hull HU6 7RX, UK

ARTICLE INFO

Keywords:
Human-wildlife conflict
Cervus elaphus
Delphi
Participatory workshop
Stakeholders
Adaptive impact management

ABSTRACT

Human-wildlife conflicts are often symptomatic of underlying human-human conflicts, characterised by opposing viewpoints, unclear or limited communication, and failure to compromise. Participatory approaches towards resolving human-wildlife conflict have previously demonstrated success in creating effective wildlife management plans. In the UK, the red deer (*Cervus elaphus*) is a charismatic native species, yet it is capable of negatively impacting landscape conservation efforts, farming and forestry, and environmental restoration targets. Here, we employed a facilitated workshop, as the decision-making end point to a modified Delphi process, to foster communication between key interested parties in the Lake District National Park, UK, aiming to produce an adaptive impact management framework for red deer. Crucially, consensus was achieved for a vision of adaptive landscape management, objectives for the landscape, monitoring actions, and methods of deer population control, and the resulting framework will underpin management policy for this interest group. During this study facilitated consensus-building among interested parties was critical for the co-creation of policy and plans in order to progress towards the resolution of a long-standing conflict with red deer. It stands as an example for interest group engagement with a view to mitigate a human-wildlife conflict in a multi-user landscape.

1. Introduction

Human-wildlife conflict can pose critical threats to wildlife populations and is a global risk factor towards species extinction (Göttert and Starik, 2022). The IUCN (2020) described human-wildlife conflict as "struggles that emerge when the presence or behaviour of wildlife poses actual or perceived, direct and recurring threat to human interests or needs, leading to disagreements between groups of people and negative impacts on people and/or wildlife". The frequency of human-wildlife conflict has grown in tandem with increasing urban and sub-urban sprawl into wildlife habitats (König et al., 2020). In Europe, increased human-wildlife conflicts are also linked to the return and increase in species presence (e.g. predator species- Liukkonen et al., 2009; Delibes-Mateos, 2015; Kaiser et al., 2025) and numbers (e.g. ungulates- Apollonio et al., 2010; Delibes-Mateos, 2015; Carpio et al., 2021).

As human-wildlife conflicts increase in frequency and severity, policy interventions to financially incentivise coexistence (e.g. Naha et al., 2020; Barlow et al., 2013), outlaw activities (e.g. illegal killing) that threaten protected species (e.g. Barlow et al., 2013; Campbell-Palmer et al., 2021), promote the removal of 'problem animals' (e.g. Fukuda et al., 2014; Baker et al., 2024) and minimise negative interactions with people that exacerbate conflicts (e.g. Barlow et al., 2013). However, many of these policy interventions have had limited success, for example Eurasian beaver, *Castor fiber*, in the UK continue to be illegally persecuted near agricultural landscapes despite established co-existence schemes with landowners, and legal protection in Scotland from unlicensed killing (Campbell-Palmer et al., 2021). Unsuccessful attempts at preventing human-wildlife conflict are often a result of failing to address the underlying disagreements between people (Madden and McQuinn, 2014; Bhatia et al., 2020; Woolaston et al., 2021). Persecution of wildlife deemed a problem will therefore likely continue unless the roots of the conflict are directly addressed (Madden and McQuinn, 2014; Richardson et al., 2020; Zimmermann et al., 2020).

Co-created solutions have been proposed as a means of resolving or mitigating such conflicts. These are collaboratively developed by interest groups to design and implement mutually valued outcomes.

* Corresponding author.
E-mail address: twlog@hotmail.co.uk (T.W. Logan).

https://doi.org/10.1016/j.biocon.2025.111380
Received 7 April 2025; Received in revised form 5 June 2025; Accepted 16 July 2025
Available online 22 July 2025

However, as solutions are very difficult to achieve, and context dependent as to whether eliminating conflict is possible, management tools to mitigate conflict are a more regularly achievable outcome (Redpath et al., 2013; Carter and Linnell, 2016; Nyhus, 2016; Linnell et al., 2020. For instance, human wildlife conflicts between livestock farmers, tigers (*Panthera tigris*), and conservationists has required mitigations that reduce both livestock predation and tiger persecution (e.g. Barlow et al., 2013). Other co-created mitigations have also been used to mitigate and prevent crop damage by Asian elephants, *Elephas maximus*, (Naha et al., 2020). In the above examples, social impacts and conflicts between interested parties were key obstructions to achieving co-created solutions. This is consistent with human-wildlife conflicts being commonly accompanied by human-human conflicts (e.g. Goyes, 2022; Ramos, 2022), thus understanding the social tolerances for wildlife is a key element in conflict resolution/mitigation.

Social tolerances for conflicts with wildlife, and wildlife management methods, are variable across socio-economic categories, such as between developed and developing countries (Dickman, 2010), and rural and urban environments (Kansky et al., 2016). To develop co-created solutions, the variety of social tolerances needs to be clearly communicated (Olsen, 2022) in order to enable equitable discussion (White and Ward, 2010). Social elicitation methods can be used to facilitate those discussions, including evidence-informed discussion of challenging topics, such as lethal and non-lethal wildlife management methods (Smith et al., 2021; van Poorten and Beck, 2021; Cinque et al., 2022; Nelson et al., 2023).

Adaptive management strategies (a process of ongoing planning, management, evaluation and adaptation (Williams, 2011)) have become common practice in wildlife management. A core aspect of the adaptive management framework proposed by Williams (2011), was to include specific considerations for the needs of stakeholders in management planning and action. By those considerations, the social conflicts, and direct wildlife conflicts, can both be addressed more effectively through adaptive management. The flexibility of adaptive strategies enables adjustments for the changing needs of practitioners and for uncertainties in wildlife population parameters (Williams, 2011; Richardson et al., 2020). Adaptive strategies have demonstrated greater success at meeting management objectives compared to static targets, demonstrated in coral conservation (Gelves-Gomez et al., 2024), game harvesting (Nagy-Reis et al., 2021), and invasive species management (Richardson et al., 2020; Davis et al., 2022). Using adaptive management for wild deer populations has been successfully implemented across North America (Conner et al., 2021; Nagy-Reis et al., 2021) and in Europe (e.g. Andersen et al., 2010; Bödeker et al., 2021). In the UK, deer management has been targeted towards mitigating negative impacts to anthropogenic and environmental objectives (Putman, 2010; Putman, 2024) across multiple land-ownership boundaries. Yet, government agencies in the UK have reported increased negative impacts from deer, which has resulted in difficulty establishing young trees, impacting forest regeneration, and hindering habitat restoration targets (e.g. Forestry and Land Scotland, 2021; Forestry Commission, 2022). A shift to the adaptive management of deer at the scale at which their populations operate (landscape-scales) might contribute to resolving these conflicts more successfully but requires cooperation among affected interested parties.

In the UK, deer management has become a priority for national policy makers to support environmental restoration policies by reducing negative deer-related ecological and economic impacts (e.g. DEFRA, 2018; NatureScot, 2024). For example, in England WS1 is a voluntary participation, government funded, Environmental Land Management Scheme, administered by the Forestry Commission (2023). The role of WS1 is to financially incentivise landowners to manage deer and monitors deer impacts in woodlands (Forestry Commission, 2023). However, there are no legislative powers across the UK (excluding Scotland) to enforce deer management actions to meet public objectives. Further, private landowners may face conflicts between reducing deer populations to mitigate impacts and achieving their own objectives, such as those of private shooting estates (Pepper et al., 2019). Kirkland et al. (2021) previously identified that social conflicts negatively impact deer management outcomes, such that success requires a reduction of social conflicts.

Red deer, *Cervus elaphus*, offer a good example of human-wildlife conflicts in the UK as they range across multiple ownership boundaries throughout landscapes. People are likely to have varying opinions towards red deer populations regarding the presence and impacts of the species. The varying attitudes and values that form these opinions can influence land-use objectives that determine whether impacts are considered positive or negative, affecting property level management actions (Woolaston et al., 2021). Conflicts with red deer can result from grazing, browsing and trampling impacts to areas of conservation concern, arable crops, woodlands and plantation forests, and also from collisions with vehicles (Putman, 2010; Putman, 2024; Mattioli et al., 2022).

As a native species, there are efforts to maintain healthy populations of red deer within their extant ranges. To manage wild deer, there are a range of legally permitted methods including culling and exclusion (Deer Act, 1991), but these vary in effectiveness, can be context-dependent, and may not be mutually compatible with others (Apollonio et al., 2010). However, under UK laws (Deer Act 1991 in England) the right to take deer belongs to the owners of the shooting rights for the land they are on (normally the landowner). Therefore, in many instances, deer management decisions have been made in isolation and without collaboration. Consequently, property level management decisions for red deer can impact neighbouring properties, causing friction between landowners when actions conflict with the values among the local community of interested parties (Ehrhart et al., 2022).

Conflicts surrounding a red deer population exist across neighbouring properties in the Borrowdale and Thirlmere landscape, Lake District National Park, UK. This landscape has an extant native red deer population and is predominantly privately owned by the National Trust and United Utilities. Organisational objectives of the National Trust focus on nature protection, whilst United Utilities prioritises maintaining healthy environments to enable high quality water provisions. Consistent with the Deer Act 1991, only the landowners have the legal right to take deer in this landscape, with no requirement to collaborate with each other. Therefore, red deer, and their management, impacts a number of different organisational objectives across the landscape. Most residents, farmers and businesses depend on the landscape, with many in tenancy to the two main landowners. The area also includes seven conservation designated sites (Fig. 1) and Borrowdale Rainforest National Nature Reserve. As such, red deer impacts are also of concern to the nature conservation and forestry regulatory authorities, Natural England and the Forestry Commission. With contrasting landscape objectives, conflicts have emerged between key interested parties that may be resolved by co-creating solutions.

Here, we used a modified Delphi process to develop consensus on, and commitment to, adaptive red deer management across the Borrowdale and Thirlmere landscape. We conducted an in-person workshop with a focussed group of key interested parties to consolidate a facilitated discussion, and decision-making on, adaptive deer management. Our objectives were to: i) establish a unified vision for deer management in Borrowdale and Thirlmere; ii) define landscape objectives to support this vision; iii) reach an agreement on the data required to inform management actions; iv) determine the specific management actions to be implemented; and v) develop a framework for adaptive impact management decision-making for the red deer population.

2. Materials and methods

The Delphi process is a structured and facilitated group discussion technique (usually anonymously) applied to complex topics to create consensus or identify divisions in opinions and decision-making

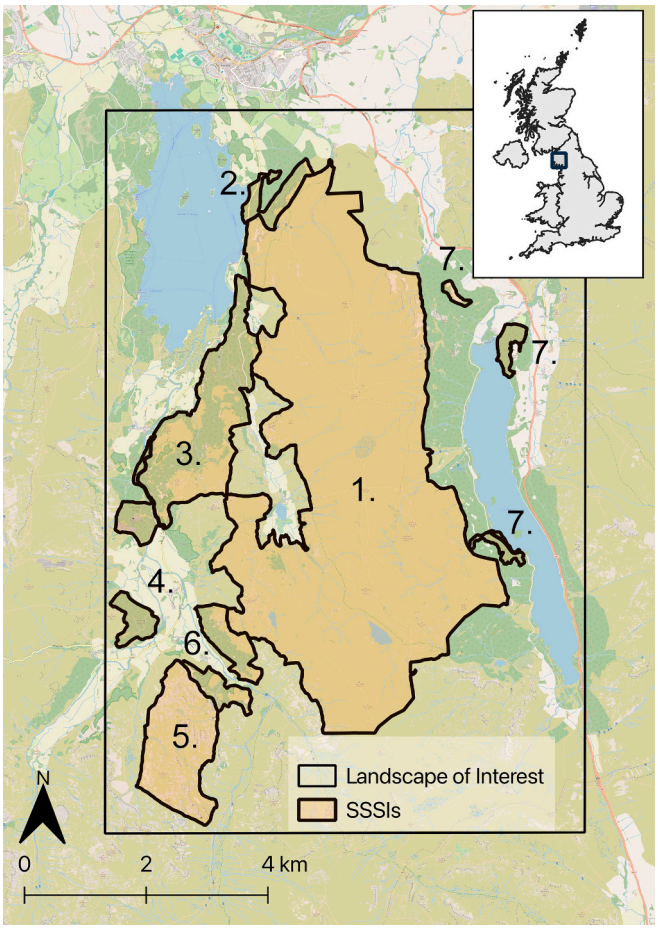

Fig. 1. Site map of the landscape of interest in Borrowdale and Thirlmere, with an inset map of the UK showing the location of the Lake District National Park via a dark blue squared polygon. The numbered polygons are the seven SSSIs in the landscape: 1) Armboth Fells SSSI; 2) Great Wood SSSI; 3) Lodore-Troutdale Woods SSSI; 4) Johnny Wood SSSI; 5) Rosthwaite Fell SSSI; 6) Stonethwaite Wood SSSI; 7) Thirlmere Woods SSSI. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

(Linstone and Turoff, 2002; Hsu and Sandford, 2007). The process is also used to incorporate inputs from participants to resolve complex problems, clarify limited and obscure information sources, and resolve conflicts between people (Mukherjee et al., 2015). Application of Delphi is highly adaptable in data collection strategies (e.g. workshops, questionnaires, interviews), application (e.g. level of anonymity), and analyses to suit a wide range of contrasting questions (Yousuf, 2019). Thus, Delphi processes have been increasingly used to resolve problems in wildlife management and conservation (Glass, 2011; Rust, 2017; Amit and Jacobson, 2018; Hopkins et al., 2018; Donfrancesco et al., 2023).

Our Delphi process began in October 2022 and consisted of three emailed questionnaire rounds and a final decision-making workshop in April 2023. Following Glass et al. (2013) and Hopkins et al. (2018), a stakeholder map was created to identify the organisations and interested parties related to deer management in the landscape. The questionnaire rounds invited responses from a wide community of interested parties as part of a wider survey process. 13 participants completed the first questionnaire, 11 completed the second questionnaire, and nine completed the third questionnaire. The withdrawals of two participants per round were attributed to survey fatigue. The questionnaire participants were selected by purposive sampling to represent a wide range of perceptions across the landscape, with additional participants identified by recommendation from partner organisations. Participants comprised of: four landowner representatives [1 = questionnaire 1 only; 3 = questionnaires 1–3]; three members of the civil service [questionnaires 1–3]; three local residents [1 = questionnaire 1 only; 1 = questionnaires 1–2; 1 = questionnaires 1–3]; two professional deer managers [questionnaires 1–3]; one tenant farmer [questionnaires 1–2].

These questionnaires sought to facilitate discussion on the perceptions and needs of people for deer management in Borrowdale and Thirlmere. This included: understanding and acceptability of deer management (questionnaire 1); information required and objectives to inform management actions (questionnaire 2); methods to management deer (questionnaire 3). Participants of the final decision-making workshop were invited if they met one or more of the following criteria: active role in the management of deer in the landscape, decision-making responsibilities for management of deer in the landscape, and regulatory authority regarding nature conservation and woodland management in the landscape.

Six of the seven participants selected for the decision-making workshop (Table 1) were selected from participants of the questionnaire rounds. The seventh was a representative of a participant who was unable to attend the workshop and worked in the same organisation. The workshop participants included representatives of the National Trust and United Utilities (landowners), Natural England and the Forestry Commission (government conservation and forestry regulatory bodies), and two independent contractor deer managers (responsible for planning and enacting culling) for the area. The participants therefore represented a broad scale of professional opinions and experience.

The results of the three questionnaire rounds were presented at the decision-making workshop to inform discussion. Results presented in this paper reflect the final outcomes from the decision-making workshop, informed by the decisions from participants of the earlier questionnaire rounds. Focus group workshops have been used in multiple studies and Delphi processes as a decision-making end point (e.g. MacMillan and Marshall, 2006; Rust, 2017; Hopkins et al., 2018; Segar et al., 2022) and therefore was used in this research to both create decisions and ensure effective cooperation, which will be required once the facilitators are no longer involved.

2.1. Data collection and analysis

The workshop was structured into three one-hour sessions: i) defining a vision and objectives for the Borrowdale and Thirlmere landscape, and agreeing data needed to measure progress towards the vision; ii) achieving consensus on methods of deer management; iii) producing an adaptive impact management framework for the red deer population. In all the workshop sessions participants used sticky notes to record their observations, responses to other participants' inputs and further thoughts resulting from the discussion. Facilitators offered prompts to individuals for equitable representation, and to the group to keep the discussion focussed and to drive the decision-making process.

Table 1
Summary of workshop participants and identification method.

Participant	Organisation	Participant type	Identification method
1	National Trust	Landowner / decision-maker / deer manager	Researcher's initial network
2	United Utilities	Landowner / decision-maker	Researcher's initial network
3	Natural England	Conservation regulator	Researcher's initial network
4	Natural England	Conservation regulator	Researcher's initial network
5	Forestry Commission	Forestry regulator	Reputation / Referral (Direct Approach)
6	Independent Contractor	Deer manager	Researcher's initial network
7	Independent Contractor	Deer manager	Reputation / Referral (Direct Approach)

Sticky notes produced in each session were added to flip charts and were grouped into emergent themes by the facilitators during the workshop (Drinkwater, 2020). Participants were able to comment on the emergent themes, move sticky notes and alter themes in response to the ongoing discussion. Field notes were written by the two facilitators during and after the workshop. Following the workshop, field notes and sticky notes for each session were collated, coded and thematically analysed to identify the emerging themes of discussion from the participants (Braun and Clarke, 2006; Saldaña, 2021).

3. Results

3.1. Vision and objectives

The agreed vision for red deer management in the Borrowdale and Thirlmere landscape as a result of the workshop was to: "Create an adaptive impact management framework that is driven by the achievement of established objectives underpinned by high quality data, and delivered in collaboration with key stakeholders, communicated to a wider stakeholder community". The vision was framed by the agreed outcomes of this workshop, combining the need for adaptive management with the three agreed objectives below. This vision achieved consensus by participants at the end of the workshop.

During the questionnaire process, three recurring themes arose from questions regarding landscape objectives and were agreed by completion of the final questionnaire. The first was the need to ensure that landscape regeneration and biodiversity were key outcomes, without impacting the needs of people. The second was to ensure effective communication between decision-makers and the wider stakeholder community to ensure people in the community were well-informed about deer management. The final theme was to ensure a specific objective that facilitates a healthy population of native red deer that did not hinder landscape regeneration or the needs of people. Based on these principles, the workshop participants established the three objectives below to achieve the vision and meet the themes from the questionnaire process.

Objective 1: "To achieve a healthy, resilient landscape that supports biodiversity, nature recovery, the delivery of ecosystem services and viable businesses".

Objective 2: "To promote positive and constructive engagement with relevant stakeholders".

Objective 3: "To manage a healthy deer population while ensuring mitigation of negative impacts".

In creating the objectives, a core theme of the participant discussion was ecosystem services and the need to ensure delivery of water quality, food provisioning, healthy wildlife populations and habitats, and public enjoyment of the landscape across Borrowdale and Thirlmere. **Participant 2** stated that a "resilient landscape [was needed] to support habitats and species" and to ensure "resilient catchment for water quality". This was agreed by the other participants, and the importance of "viable businesses delivering for public benefit (including farming)" (**Participant 3**) and "food production [both] agricultural and wild sourced" (**Participant 4**). The importance of "ecosystem recovery [to improve and recover] natural processes" (**Participant 2**) and wider "nature recovery" (**Participant 3**) was also mentioned in relation to the delivery of ecosystem services.

For objective 3, there was consensus among the participants that there should be a "healthy red deer population" [within the landscape] (**Participant 3**). It was, however, noted that there may be conflict with farming through the competition of both "deer and sheep [that] needs to be taken into consideration" (**Participant 1**) in management actions. There would likely be a requirement for "new models of farming" (**Participant 7**) to avoid some of these conflicts, and a need for "positive communication with farmers on deer management" (**Participant 5**) to ensure the red deer do not negatively impact people. Participants felt that by managing those relationships and impacts, a well-managed red deer population will be able to exist in the landscape.

To ensure effective use of the agreed framework, all participants agreed that the framework needed to be adaptive and therefore evaluated regularly. By active and regular evaluation, adaptive management actions will readily "respond to [data] changes" indicating a need to "adjust management actions" to meet the desired objectives (**Participant 5**). However, participants agreed unanimously that any such adjustments to management actions must be agreed by the key landscape interest groups (Table 1) to avoid contradicting Objective 2 and reducing the likelihood of success for Objectives 1 and 3. To further meet Objective 2, deer management decisions would need to be "communicated to the wider [stakeholder] community" (**Participant 1**) to ensure "positive and constructive engagement" (**Participant 2**) throughout the landscape. All decisions on vision and objectives achieved consensus.

3.2. Information needs

Participants of the preceding questionnaires identified, through open questioning, and ranked (scales of 1 = most important – 7 = least important) seven types of information as measurements of the deer population (Table A1) to inform red deer management decision- making. These measurements were presented for discussion at the workshop (Table A1): 1) animal welfare; 2) population size; 3) deer impacts; 4) range and movement; 5) collaborations; 6) population dynamics; 7) traffic collisions. To effectively manage the red deer population across Borrowdale and Thirlmere, participants unanimously agreed that the impacts of deer were key to "informing [the type of] management action" (**Participant 7**) to be undertaken. Specifically, the "impacts from trampling and [herbivory] in woodland and open hill [ecotopes]" **(Participant 3**) would inform management actions (e.g. decreasing a population size). These deer impacts could be determined through "activity and impact [a quick, industry-standard impact assessment method (Forestry Commission, 2023)]" surveys (**Participant 5**) for consistency with policy makers and other management practitioners.

All participants unanimously agreed that the population size (and to a lesser extent the population dynamics) were needed to "set targets" to achieve the management objectives (**Participant 4**). Participants wanted access to reliable and fast estimates on the population size of deer, with "permanent data that could be [kept and] scrutinised" to assist in creating informed management targets (**Participant 1**). Multiple population size methods were considered by the participants in their discussion, with consensus achieved on annual drone census surveys based on the remit of fast, reliable and permanent records of the deer population. It was also noted that drone census counts would "allow us to understand [sex ratios]" (**Participant 5**), which would satisfy the need to understand population dynamics to inform management. Participants unanimously rejected sampling methods for population estimates, such as modelling data from trail cameras, due to effort, cost, and needing specialist knowledge and training.

Deer welfare (defined by participants as the health of the herd and individual animals) was considered important for meeting objective 3. But it was suggested that welfare did not require specific data collection as "we already get this from culled deer" (i.e. animal weights, parasite load, disease prevalence, and embryos/lactating females) (**Participant 6**). It was unanimously agreed that collating welfare information was needed to, in part, achieve Objective 3, without being considered key to impact management decision-making. The remaining measurements were unanimously rejected, with minimal discussion, and deemed to be not needed in this framework. All decisions for information needs achieved consensus.

3.3. Management methods

With agreements in place for information needs, the participants then sought to decide which population control methods to use in management (Table A2). The preceding questionnaires identified,

through open questioning, and ranked (scales of 1 = most acceptable/effective – 5 = least acceptable/effective) methods for deer management as: 1) lethal control; 2) exclusion and repellence; 3) predator reintroduction; 4) fertility control; 5) translocations.

Lethal control by professional deer managers was the preferred action for all participants as the only method that reduces a population size, and that it should be used to complement strategic exclusion methods. Participants discussed their intention to reduce large-scale exclusion efforts due to their cost and lack of standalone effectiveness. However, "combining lethal control and a combination of tree tubes and fencing can be effective in reducing [browsing] impacts to trees" (**Participant 2**). "These methods should be strategic in their use" (**Participant 1**), but "only lethal control will work to reduce overall deer impact" (**Participant 5**).

Predator reintroductions were rejected by all participants due to legal and practicality constraints. For example, participants thought that there are not enough interconnected or appropriate habitats for large predators like lynx (*Lynx lynx*), and a high risk of conflict with livestock farmers which would likely lead to persecution of the introduced species. It was, however, noted that it "would be nice" to see such extirpated species "return to Scotland" (**Participant 7**) and "the Lake District" (**Participant 1**). Translocation of red deer was also discussed and concluded as ineffective by all participants, with **Participant 3** informing the participants that no translocation licences would be issued by Natural England without exceptional circumstances. The final method, which was also unanimously rejected, was the use of fertility control, such as a contraceptive vaccine. This control method was rejected due to legal restrictions, difficulty in administering contraceptives, costs of administering contraceptives, and their usage not fitting the objectives of natural processes in the area. All decisions on methods achieved consensus.

3.4. The adaptive impact management framework

The adaptive impact management framework developed by the workshop participants (Fig. 2.) established the problem to be addressed, the vision for the landscape in question and agreed objectives to achieve the vision. The framework contains the core requirements of adaptive impact management, with evaluation embedded throughout (see Williams, 2011). Key components of adaptive impact management in this framework include: i) clear objectives; ii) methods of management; iii) population modelling; iv) monitoring data collected; v) evaluation of management; vi) adjustments; vii) stakeholder collaboration and communication. Important considerations for implementing the framework proposed by the participants were to ensure that management decision-making is collaborative and based upon continuously improving information, extracted from monitoring data each month and no longer using static annual targets.

It was further agreed that successful implementation would require receiving a "summary document of the framework" to integrate directly into policy (**Participant 1**). Further, successful implementation in the community would require "talking to stakeholders that are not here" (**Participant 4**) about "what we have been discussing today" (**Participant 5**), and by openly sharing "our objectives, and how we monitor" the success of management actions (**Participant 2**). Under this framework, red deer population size and dynamics will no longer be calculated from census, instead using annual drone surveys and combined with cull data for population modelling to evaluate previous and future actions. Based on the outcomes of these population models, and monitoring the deer impacts, management actions will be evaluated each month to better meet the objectives set by the participants. With the above agreements, the participants unanimously adopted this adaptive impact management framework for deer impact management policy across the landscape from November 2023.

4. Discussion

Landowners in Borrowdale and Thirlmere have been managing red deer in the area for many decades, but existing social conflicts had been impacting relationships with key interest groups across the landscape. The landowners expressed an interest in facilitated engagement with the community to help achieve a deer management solution that could gain local support, initiating our study. Via a facilitated Delphi process, participants achieved consensus for co-created mitigations to conflicts between participants over deer management and landscape-use objectives in Borrowdale and Thirlmere. Without addressing the conflicts between interested parties, effective mitigations for successful deer management would be unlikely to be achieved (Kirkland et al., 2021).

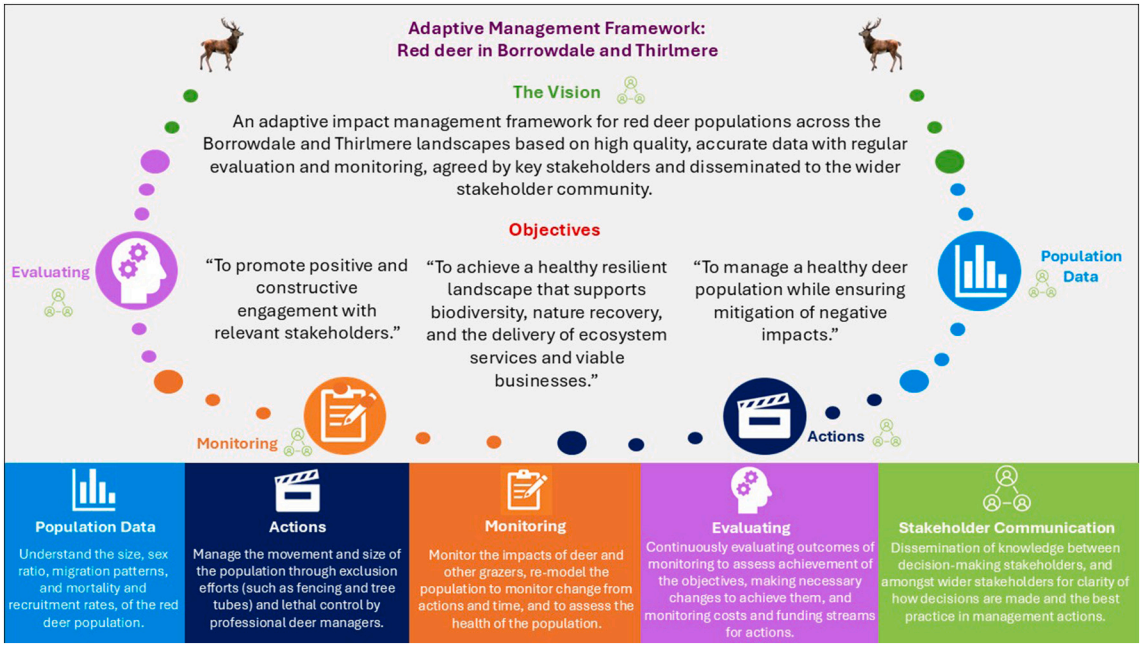

Fig. 2. Adaptive impact management framework for wild red deer, *Cervus elaphus*, developed by the workshop participant community of key stakeholders across the Borrowdale and Thirlmere landscape. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Crucially, consensus has been achieved for a unified vision for the landscape, management objectives, management methods, and measurements of success.

Here participants achieved consensus on a co-created vision of adaptive impact management for red deer in Borrowdale and Thirlmere, focusing on habitat recovery actions informed by regularly evaluated data, with decisions made between key interested parties and communicated to the local community. Discussion towards achieving this consensus focussed on combining the needs of people and nature, and effectively communicating throughout decision-making. Considerations of nature and people nature decision-making to improve likelihood of success is consistent with the conclusions from Vatn et al. (2024). Achieving this vision was important for outlining long-term aspirations and providing guidance for developing strategic objectives (e.g. Jones and Kirk, 2018; van de Water et al., 2023) to later guide implementing deer management actions. As vision statements have been demonstrably valuable towards achieving desirable outcomes from conservation efforts (e.g. Merkle et al., 2019), achieving one was considered essential for participants to frame management objectives to inform subsequent efforts (Jones and Kirk, 2018; van de Water et al., 2023), and to reduce institutional obstructions (e.g. Redpath et al., 2013). From the achieved vision, participants gained consensus for three main objectives to measure the performance of management actions, which is a key component of adaptive management (see Williams, 2011).

From our workshop, the agreed components within the co-created decision-making framework were mostly reflective of the opinions expressed in the questionnaire process, with few instances of deviating from the priorities of the wider community. The topics of objectives and the priority methods of management from the workshop were directly reflective of the questionnaires; with rejections for translocation, predator reintroduction, and fertility control based on legal restrictions in the UK. Conversely, the agreed information needs were not fully reflective of the questionnaires (e.g. range and movement and collaborations were not considered more important than population dynamics by workshop participants). This could impact the community perspective of legitimacy in decision-making (Vatn et al., 2024), which in turn may impact implementation of management actions in situ (e.g. Redpath et al., 2013). But, discussion from workshop participants ensured decisions were made based on priority data (population size and deer impacts) difficulty (practical and legal restrictions for GPS collaring deer), legal responsibility (traffic collisions), and not considering collaborations to be a measurable information need.

Rejecting range and movement as an information need was surprising from our perspective, as the data would be significantly beneficial to strategic management actions (e.g. strategic culling areas and fencing). Yet, there are practical difficulties and significant expense with GPS collaring deer in the UK. The complexity in obtaining two licences needed to collar deer in the UK, under the Deer Act, 1991 and Animals (Scientific Procedures) Act 1986, adds significant difficulty for landowners to consider this. On balance, we would suggest that, if decisions and rationale for them were effectively communicated with the questionnaire participants (consistent with the findings from Brown et al., 2021; Salvatori et al., 2021; Vatn et al., 2024), the findings from this work would likely be acceptable without causing conflict.

Our Delphi process of engagement took a bottom-up approach to participant engagement in human-wildlife conflict. This included allowing the participants to define the problem they perceive, through to facilitating participants in making decisions to achieve a vision and aim that they have defined. This is a novel approach towards conflict mitigation within deer management in the UK, holistically reviewing both the needs of people and nature when facilitating the co-creation of a management decision-making framework to their perceived problem (consistent with Vatn et al., 2024). The need to understand the human element of conflicts in creating effective mitigations is well-documented (e.g., Salvatori et al., 2020, 2021; Pimid et al., 2022), yet few studies have integrated this information into co-created management and conservation action plans. Previous studies have instead commonly predetermined the problem to be resolved, such as focussing upon whether deer management should occur and the social tolerances for culling (Loker et al., 1999; Kilpatrick and LaBonte, 2003; Siemer et al., 2004; Dandy et al., 2011). We have only found one study in UK deer management combining gathering attitudes and creating a decision-making framework (Dandy et al., 2009), but that framework was designed to inform users whether deer management should occur, rather than how to collaboratively enact management. Such approaches are further reflected in wider literature participatory discussions on human-wildlife conflicts, with focuses upon participant's perceptions (e.g. Loker et al., 1999; Kotulski and König, 2008; Červený et al., 2019; Bavin et al., 2020), or creating frameworks to analyse conflicts (König et al., 2021). We therefore conjecture that our bottom-up approach is an effective advancement to bridge the gap between impacted communities in human-wildlife conflicts and facilitators to co-create strategic wildlife and conservation management strategies.

This Delphi process would also be a useful tool to assist with conservation and government environmental policy actions. For example, recent UK Government environmental and conservation policies (e.g. DEFRA, 2018) necessitate creating clear landscape visions that incorporate both public and private objectives. One of these visions is the creation of the “Great North Forest” in northern England, requiring the establishment of new woodlands by planting up to 50 million trees by 2043 (DEFRA, 2018), which may conflict with alternative land-use objectives. Deer are known to impact both natural woodland regeneration (e.g. Putman and Moore, 1998; Gill and Morgan, 2010; Putman, 2024) and the establishment of new woodlands, which can act as an attractant to deer as a high value resource (Putman, 2010; Putman, 2024). Yet the provisions of the Hunting Act 2004, Deer Act 1991, and UK property law, mean that wildlife management decisions are made at property scales. Property scale management decisions risk being less effective than if performed across larger scales (Fattorini et al., 2020), which would require cooperation of multiple interested parties across landscapes. Further, making decisions at only the property scale risks creating and escalating human-human conflicts (Goyes, 2022; Ramos, 2022). To reduce this risk, involving local communities in decision-making helps create and align objectives to achieve management aims across landscapes (Richardson et al., 2020; Pimid et al., 2022). Therefore, achieving environmental and conservation policy actions could be more likely to succeed by using a similar approach to our work.

Despite consensus in agreement by participants to adopt the adaptive management framework as the deer management policy for the landscape, we did not get a clear ‘how’ this agreed policy would be used. The use of facilitators is considered a crucial trusted and impartial figure in conservation planning and mediating conflicts between affected parties (de Vente et al., 2016; White et al., 2023). But once facilitators are no longer involved, and/or if there is a change in trusted personnel, the willingness for participants to follow agreements may reduce (White et al., 2023; Nguyen et al., 2024; Niemiec et al., 2025). Grossmann and Patkó (2024) had concluded that the level of disagreement among participants had the greatest impact on whether decisions to mitigate human-wildlife conflicts would be adhered to over time. Given the extended opportunities to discuss deer management problems through our Delphi process, we were able to achieve the agreements in the workshop that reached consensus. As such, consensus we achieved may mitigate the impacts of having no continuing facilitators for our participants. However we do not know this, and it should be investigated further to evaluate this lingering question.

The growth in human-wildlife conflicts increases extinction risks for wildlife (Nyhus, 2016), demanding anthropogenic solutions to resolve them (Dickman, 2010). Most human-wildlife conflicts are actually human-human conflicts about wildlife populations (Kansky et al., 2016). Therefore, approaches that address the social conflicts involved in human-wildlife conflicts are necessary for the formulation of co-created solutions and mitigations. Our study highlighted the value of using a

modified Delphi process in engaging diverse interested parties to build consensus for a co-developed adaptive management framework for red deer in and upland landscape in England. This consensus building process should be adapted and tested in areas with persisting conflicts to assess whether it will be effective for more contentious case studies of human- wildlife conflicts. Should this prove successful, overcoming social challenges in co-created mitigations to human-wildlife conflicts will be more accessible. Working with key interested parties allows social complexities affecting conservation and wildlife management to be better understood. By balancing the needs of people with landscape health, co-created visions for landscapes can enable social cohesion and allow outcomes that mitigate human-wildlife conflicts.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.biocon.2025.111380.

CRediT authorship contribution statement

Thomas William Logan: Writing – review & editing, Visualization, Methodology, Formal analysis, Conceptualization, Writing – original draft, Project administration, Investigation, Data curation. **Alastair Iain Ward:** Writing – review & editing, Methodology, Supervision, Conceptualization. **Charlotte Rachael Hopkins:** Writing – review & editing, Methodology, Data curation, Supervision, Investigation, Conceptualization.

Declaration of competing interest

The authors have no interests to declare.

Acknowledgements

This work was funded by the Leeds-York-Hull Natural Environment Research Council (NERC) Doctoral Training Partnership (DTP) Panorama under grant NE/S007458/1. We would like to thank the Lake District National Park Authority for providing an independent venue for our workshop. We also give thanks to Rory Putman for his technical advice. Finally, we want to thank all participants of this study for their engagement.

Compliance with ethical standard

All procedures were performed in accordance with the ethical standards of the University of Leeds; reference BIOSCI 22–002. Informed consent was given by all participants in this study for their participation and responses to be anonymously presented.

Data availability

Anonymised raw data responses will be made available upon request.

References

Amit, R., Jacobson, S.K., 2018. Participatory development of incentives to coexist with jaguars and pumas. Conserv. Biol. 32 (4), 938–948.
Andersen, R., Lund, E., Solberg, E.J., Saether, B.E., 2010. Ungulates and their management in Norway. In: Apollonio, M., Andersen, R., Putman, R. (Eds.), European Ungulates and their Management in the 21st Century. Cambridge University Press, pp. 14–36.
Apollonio, M., Andersen, R., Putman, R. (Eds.), 2010. European Ungulates and their Management in the 21st Century. Cambridge University Press.
Baker, C.J., Campbell, M.A., Udyawer, V., Kopf, R.K., Campbell, H.A., 2024. The influence of crocodile density on the prevalence of human attacks. People and Nature 6 (5), 1922–1932.
Barlow, A.C., Ahmad, I., Smith, J.L., 2013. Profiling tigers (*Panthera tigris*) to formulate management responses to human-killing in the Bangladesh Sundarbans. Wildl. Biol. Pract. 9 (2), 30–39.
Bavin, D., MacPherson, J., Denman, H., Crowley, S.L., McDonald, R.A., 2020. Using Q-methodology to understand stakeholder perspectives on a carnivore translocation. People Nat. 2 (4), 1117–1130.
Bhatia, S., Redpath, S.M., Suryawanshi, K., Mishra, C., 2020. Beyond conflict: exploring the spectrum of human–wildlife interactions and their underlying mechanisms. Oryx 54 (5), 621–628.
Bödeker, K., Ammer, C., Knoke, T., Heurich, M., 2021. Determining statistically robust changes in ungulate browsing pressure as a basis for adaptive wildlife management. Forests 12 (8), 1030.
Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. Qual. Res. Psychol. 3 (2), 77–101.
Brown, H.O., Jacobson, S.K., Cockrell, M., Sutt, J., Allen, K., Copeland, A., 2021. A five-step stakeholder communication plan for more effective natural resource management. J. Ext. 59 (4), 6.
Campbell-Palmer, R., Rosell, F., Naylor, A., Cole, G., Mota, S., Brown, D., Fraser, M., Pizzi, R., Elliott, M., Wilson, K., Gaywood, M., 2021. Eurasian beaver (*Castor fiber*) health surveillance in Britain: assessing a disjunctive reintroduced population. Vet. Rec. 188 (8), 1–9.
Carpio, A.J., Apollonio, M., Acevedo, P., 2021. Wild ungulate overabundance in Europe: contexts, causes, monitoring and management recommendations. Mammal Rev. 51 (1), 95–108.
Carter, N.H., Linnell, J.D., 2016. Co-adaptation is key to coexisting with large carnivores. Trends Ecol. Evol. 31 (8), 575–578.
Červený, J., Krojerová-Prokešová, J., Kušta, T., Koubek, P., 2019. The change in the attitudes of Czech hunters towards Eurasian lynx: is poaching restricting lynx population growth? J. Nat. Conserv. 47, 28–37.
Cinque, S., Sjölander-Lindqvist, A., Sandström, C., 2022. Frontline bureaucrats in wildlife management: caught in the dilemma between effectiveness and responsiveness. Environ. Policy Gov. 32 (1), 17–28.
Conner, M.M., Wood, M.E., Hubbs, A., Binfet, J., Holland, A.A., Meduna, L.R., Roug, A., Runge, J.P., Nordeen, T.D., Pybus, M.J., Miller, M.W., 2021. The relationship between harvest management and chronic wasting disease prevalence trends in western mule deer (Odocoileus hemionus) herds. J. Wildlife Dis. 57 (4), 831–843.
Dandy, N., Ballantyne, S., Moseley, D., Gill, R., Quine, C., 2009. The management of roe deer in peri-urban Scotland. Forest Research: Farnham, UK.
Dandy, N., Ballantyne, S., Moseley, D., Gill, R., Peace, A., Quine, C., 2011. Preferences for wildlife management methods among the peri-urban public in Scotland. Eur. J. Wildl. Res. 57, 1213–1221.
Davis, A.J., Farrar, R., Jump, B., Hall, P., Guerrant, T., Pepin, K.M., 2022. An efficient method of evaluating multiple concurrent management actions on invasive populations. Ecol. Appl. 32 (6), e2623.
de Vente, J., Reed, M.S., Stringer, L.C., Valente, S., Newig, J., 2016. How does the context and design of participatory decision making processes affect their outcomes? Evidence from sustainable land management in global drylands. Ecol. Soc. 21 (2), 24.
Deer Act, 1991. (c.54). [Online]. London: HMSO. [Accessed 1st July 2024]. Available from. https://www.legislation.gov.uk/ukpga/1991/54/pdfs/ukpga_19910054_en.pdf.
DEFRA, 2018. A Green Future: Our 25 Year Plan to Improve the Environment. Department for Environment, Food and Rural Affairs, London.
Delibes-Mateos, M., 2015. Conservation conflicts involving mammals in Europe. Therya 6 (1), 123–137.
Dickman, A.J., 2010. Complexities of conflict: the importance of considering social factors for effectively resolving human–wildlife conflict. Anim. Conserv. 13 (5), 458–466.
Donfrancesco, V., Allen, B.L., Appleby, R., Behrendorff, L., Conroy, G., Crowther, M.S., Dickman, C.R., Doherty, T., Fancourt, B.A., Gordon, C.E., Jackson, S.M., 2023. Understanding conflict among experts working on controversial species: a case study on the Australian dingo. Conserv. Sci. Pract. 5 (3), e12900.
Drinkwater, R., 2020. 5 rules for efficient workshop facilitation. ITNOW 62 (1), 62–63.
Ehrhart, S., Stühlinger, M., Schraml, U., 2022. The relationship of stakeholders' social identities and wildlife value orientations with attitudes toward red deer management. Hum. Dimens. Wildl. 27 (1), 69–83.
Fattorini, N., Lovari, S., Watson, P., Putman, R., 2020. The scale-dependent effectiveness of wildlife management: a case study on British deer. J. Environ. Manag. 276, 111303.
Forestry and Land Scotland. 2021. *Deer numbers placing unprecedented pressure on environment.* [Online]. [13/03/2025]. Available from: https://forestryandland.gov.scot/news-releases/deer-numbers-placing-unprecedented-pressure-on-environment#:~:text=%E2%80%9CThe%20current%20high%20levels%20of,response%20to%20the%20climate%20emergency.
Forestry Commission. 2022. *Reducing the impact of deer on the natural environment - consultation opens.* [Online]. [13/03/2025]. Available from: https://forestrycommission.blog.gov.uk/2022/08/04/reducing-the-impact-of-deer-on-the-natural-environment-consultation-opens/#:~:text=Evidence%20of%20the%20negative%20effects,per%20year%20to%20deer%20damage.
Forestry Commission, 2023. *WS1 Deer Habitat Impact Activity Survey Guide* [Online]. London. Available from: https://assets.publishing.service.gov.uk/media/63f8c4058fa8f527f9834c98/WS1_Deer_Habitat_Impact_Activity_Survey_Guide_.docx.
Fukuda, Y., Manolis, C., Appel, K., 2014. Management of human-crocodile conflict in the Northern Territory, Australia: review of crocodile attacks and removal of problem crocodiles. J. Wildl. Manag. 78 (7), 1239–1249.
Gelves-Gomez, F., Carter, J., Beilin, R., Brincat, S., 2024. "Ordering the wild": how adaptive management is used to maintain nature like a postcard. Soc. Nat. Resour. 37 (5), 791–808.
Gill, R.M.A., Morgan, G., 2010. The effects of varying deer density on natural regeneration in woodlands in lowland Britain. Forestry 83 (1), 53–63.

Glass, J.H., 2011. The Power of the Research Process: Co-Producing Knowledge for Sustainable Upland Estate Management in Scotland. Ph.D. thesis, Aberdeen University.
Glass, J.H., Scott, A.J., Price, M.F., 2013. The power of the process: co-producing a sustainability assessment toolkit for upland estate management in Scotland. Land Use Policy 30 (1), 254–265.
Göttert, T., Starik, N., 2022. Human–wildlife conflicts across landscapes—general applicability vs. case specificity. Diversity 14 (5), 380.
Goyes, D.R., 2022. The importance of stories in wildlife management. Ecol. Manag. Restor. 23 (3), 237–243.
Grossmann, C.M., and Patkó, L. 2024. Did we achieve what we aimed for? Assessing the outcomes of a human–carnivore conflict mitigation and coexistence project in Europe. Wildl. Biol., 2024(6), p.e01270.
Hopkins, C.R., Bailey, D.M., Potts, T., 2018. Navigating future uncertainty in marine protected area governance: lessons from the Scottish MPA network. Estuar. Coast. Shelf Sci. 207, 303–311.
Hsu, C.C., Sandford, B.A., 2007. The delphi technique: making sense of consensus. Pract. Assess. Res. Eval. 12 (1). https://doi.org/10.7275/pdz9-th90.
IUCN, 2020. What is HWC? [Online]. [Accessed 13 May 2025]. Available from. https://www.hwctf.org/_files/ugd/7acc16_c026ab9ffce44ea7900580771cba1cb4.pdf.
Jones, C., Kirk, N., 2018. Shared visions: can community conservation projects' outcomes inform on their likely contributions to national biodiversity goals? N. Z. J. Ecol. 42 (2), 116–124.
Kaiser, J., Hahn, T., Krueger, T., Haase, D., 2025. Investigating conservation performance payments alongside human–wildlife conflicts: the Swedish lynx and wolverine protection policies. People Nat. 00, 1–19.
Kansky, R., Kidd, M., Knight, A.T., 2016. A wildlife tolerance model and case study for understanding human wildlife conflicts. Biol. Conserv. 201, 137–145.
Kilpatrick, H.J., LaBonte, A.M., 2003. Deer hunting in a residential community: the community's perspective. Wildl. Soc. Bull. 31, 340–348.
Kirkland, H., Hare, D., Daniels, M., Krofel, M., Rao, S., Chapman, T., Blossey, B., 2021. Successful deer management in Scotland requires less conflict not more. Front. Conserv. Sci. 2, 770303.
König, H.J., Kiffner, C., Kramer-Schadt, S., Fürst, C., Keuling, O., Ford, A.T., 2020. Human–wildlife coexistence in a changing world. Conserv. Biol. 34 (4), 786–794.
König, H.J., Ceauşu, S., Reed, M., Kendall, H., Hemminger, K., Reinke, H., Ostermann-Miyashita, E.F., Wenz, E., Eufemia, L., Hermanns, T., Klose, M., 2021. Integrated framework for stakeholder participation: methods and tools for identifying and addressing human–wildlife conflicts. Conserv. Sci. Pract. 3 (3), e399.
Kotulski, Y., König, A., 2008. Conflicts, crises and challenges: wild boar in the Berlin City – a social, empirical and statistical survey. Nat. Croat. 17 (4), 233–246.
Linnell, J.D., Cretois, B., Nilsen, E.B., Rolandsen, C.M., Solberg, E.J., Veiberg, V., Kaczensky, P., Van Moorter, B., Panzacchi, M., Rauset, G.R., Kaltenborn, B., 2020. The challenges and opportunities of coexisting with wild ungulates in the human-dominated landscapes of Europe's Anthropocene. Biol. Conserv. 244, 108500.
Linstone, H.A., Turoff, M., 2002. The Delphi Method: Techniques and Applications. Addison-Wesley, Futures research methodology.
Liukkonen, T., Mykrä, S., Bisi, J., Kurki, S., 2009. Conflicts and compromises in lynx *Lynx lynx* conservation and management in Finland. Wildl. Biol. 15 (2), 165–174.
Loker, C.A., Decker, D.J., Schwager, S.J., 1999. Social acceptability of wildlife management actions in suburban areas: three case studies from New York. Wildl. Soc. Bull. 27, 152–159.
MacMillan, D.C., Marshall, K., 2006. The Delphi process – an expert-based approach to ecological modelling in data-poor environments. Anim. Conserv. 9 (1), 11–19.
Madden, F., McQuinn, B., 2014. Conservation's blind spot: the case for conflict transformation in wildlife conservation. Biol. Conserv. 178, 97–106.
Mattioli, S., Zachos, F.E., Rossi, L., Lister, A.M., Corlatti, L., 2022. Red Deer Cervus elaphus Linnaeus, 1758. In: Corlatti, L., Zachos, F.E. (Eds.), Terrestrial Cetartiodactyla, Handbook of the Mammals of Europe. Springer Nature, Cham, pp. 51–86.
Merkle, J.A., Anderson, N.J., Baxley, D.L., Chopp, M., Gigliotti, L.C., Gude, J.A., Harms, T.M., Johnson, H.E., Merrill, E.H., Mitchell, M.S., Mong, T.W., 2019. A collaborative approach to bridging the gap between wildlife managers and researchers. J. Wildl. Manag. 83 (8), 1644–1651.
Mukherjee, N., Huge, J., Sutherland, W.J., McNeill, J., Van Opstal, M., Dahdouh-Guebas, F., Koedam, N., 2015. The Delphi technique in ecology and biological conservation: applications and guidelines. Methods Ecol. Evol. 6 (9), 1097–1109.
Nagy-Reis, M., Reimer, J.R., Lewis, M.A., Jensen, W.F., Boyce, M.S., 2021. Aligning population models with data: adaptive management for big game harvests. Glob. Ecol. Conserv. 26, e01501.
Naha, D., Dash, S.K., Chettri, A., Roy, A., Sathyakumar, S., 2020. Elephants in the neighborhood: patterns of crop-raiding by Asian elephants within a fragmented landscape of eastern India. PeerJ 8, e9399.
NatureScot, 2024. Deer management: Policy, Guidance and Best Practice. [Online]. [Accessed 19th March 2025]. Available from. https://www.nature.scot/professional-advice/land-and-sea-management/managing-wildlife/managing-scotlands-wild-deer/deer-management-policy-guidance-and-best-practice.
Nelson, B.W., Walters, C.J., Trites, A.W., McAllister, M.K., 2023. Comparing lethal and non-lethal methods of active population control for harbor seals in British Columbia. J. Wildl. Manag. 84 (5), e22400.
Nguyen, L.B., Chen, H.C., Seekings, T.B.W., Dhungana, N., Chen, C.C., Lee, C.H., 2024. Integrated adaptation strategies for human–leopard cat coexistence management in Taiwan. Sustainability 16 (10), 4031.
Niemiec, R.M., Quartuch, M., Gonzalez, M., Champine, V., Mertens, A., 2025. Social outcomes associated with a public and stakeholder engagement process for wolf reintroduction. Conserv. Sci. Pract. 7 (6), e70058.
Nyhus, P.J., 2016. Human–wildlife conflict and coexistence. Annu. Rev. Environ. Resour. 41 (1), 143–171.
Olsen, C.S., 2022. Co-creation beyond humans: the arts of multispecies Placemaking. Urban Plan. 7 (2), 315–325.
Pepper, S., Barbour, A., Glass, J., 2019. *The Management of Wild Deer in Scotland.* [online]. [accessed 17th march 2025]. Available from: https://www.gov.scot/publications/management-wild-deer-scotland/pages/5/.
Pimid, M., Mohd, N.M.R., Krishnan, K.T., Chambers, G.K., Ahmad, A.G., Perijin, J., 2022. Understanding social dimensions in wildlife conservation: multiple stakeholder views. Animals 12 (7), 811.
Putman, R., 2010. Ungulates and their management in Great Britain and Ireland. In: Apollonio, M., Andersen, E., Putman, R. (Eds.), European Ungulates and their Management in the 21st Century. Cambridge University Press, New York, pp. 129–164.
Putman, R., 2024. British Deer and their Management. A Personal Reflection. Amazon, Great Britain.
Putman, R.J., Moore, N.P., 1998. Impact of deer in lowland Britain on agriculture, forestry and conservation habitats. Mammal Rev. 28 (4), 141–164.
Ramos, S., 2022. Understanding Yurok traditional ecological knowledge and wildlife management. J. Wildl. Manag. 86 (1), e22140.
Redpath, S.M., Young, J., Evely, A., Adams, W.M., Sutherland, W.J., Whitehouse, A., Amar, A., Lambert, R.A., Linnell, J.D., Watt, A., Gutierrez, R.J., 2013. Understanding and managing conservation conflicts. Trends Ecol. Evol. 28 (2), 100–109.
Richardson, S., Mill, A.C., Davis, D., Jam, D., Ward, A.I., 2020. A systematic review of adaptive wildlife management for the control of invasive, non-native mammals, and other human–wildlife conflicts. Mammal Rev. 50 (2), 147–156.
Rust, N.A., 2017. Can stakeholders agree on how to reduce human–carnivore conflict on Namibian livestock farms? A novel Q-methodology and Delphi exercise. Oryx 51 (2), 339–346.
Saldaña, J. The Coding Manual for Qualitative Researchers. 2nd ed. London: SAGE. 2021.
Salvatori, V., Balian, E., Blanco, J.C., Ciucci, P., Demeter, L., Hartel, T., Marsden, K., Redpath, S.M., von Korff, Y., Young, J.C., 2020. Applying participatory processes to address conflicts over the conservation of large carnivores: understanding conditions for successful management. Front. Ecol. Evol. 8, 182.
Salvatori, V., Balian, E., Blanco, J.C., Carbonell, X., Ciucci, P., Demeter, L., Marino, A., Panzavolta, A., Sólyom, A., von Korff, Y., Young, J.C., 2021. Are large carnivores the real issue? Solutions for improving conflict management through stakeholder participation. Sustainability 13 (8), 4482.
Segar, J., Pereira, H.M., Filgueiras, R., Karamanlidis, A.A., Saavedra, D., and Fernández, N. 2022. Expert-based assessment of rewilding indicates progress at site-level, yet challenges for upscaling. Ecography 2022(4), pp.1-10.
Siemer, W.F., Lauber, T.B., Chase, L.C., Decker, D.J., McPeake, R.J., Jacobson, C.A., 2004. Deer/elk management actions in suburban environments: what will stakeholders accept? *Proceedings of the 4th international Urban Wildlife Symposium on Urban Wildlife Conservation, 2004, Tucson, Arizona.* USA. pp. 228-237. Available from: https://cales.arizona.edu/pubs/adjunct/snr0704/snr07042t.pdf.
Smith, B.P., Appleby, R.G., Jordan, N.R., 2021. Co-existing with dingoes: challenges and solutions to implementing non-lethal management. Aust. Zool. 41 (3), 491–510.
van de Water, A., Doornwaard, S., Sluiter, L., Henley, M., Sutherland, C., Slotow, R., 2023. Resolving conservation conflicts through shared vision, collective benefits and relevant values. Diversity 15 (10), 1041.
van Poorten, B., Beck, M., 2021. Getting to a decision: using structured decision-making to gain consensus on approaches to invasive species control. Manag. Biol. Invas. 12 (1), 25.
Vatn, A., Pascual, U., Chaplin-Kramer, R., Termansen, M., Arias-Arévalo, P., Balvanera, P., Athayde, S., Hahn, T., Lazos, E., 2024. Incorporating diverse values of nature in decision-making—theory and practice. Philos. Trans. R. Soc. B 379 (1903), 20220315.
White, P.C., Ward, A.I., 2010. Interdisciplinary approaches for the management of existing and emerging human–wildlife conflicts. Wildl. Res. 37 (8), 623–629.
White, R.M., Schmook, B., Calmé, S., Giordano, A.J., Hausser, Y., Kimmel, L., Lecuyer, L., Lucherini, M., Méndez-Medina, C., Peña-Mondragón, J.L., 2023. Facilitating biodiversity conservation through partnerships to achieve transformative outcomes. Conserv. Biol. 37 (3), e14057.
Williams, B.K., 2011. Adaptive management of natural resources—framework and issues. J. Environ. Manag. 92 (5), 1346–1353.
Woolaston, K., Flower, E., Van Velden, J., White, S., Burns, G.L., Morrison, C., 2021. A review of the role of law and policy in human-wildlife conflict. Conserv. Soc. 19 (3), 172–183.
Yousuf, M.I., 2019. Using experts opinions through Delphi technique. Pract. Assess. Res. Eval. 12 (1), 4.
Zimmermann, A., McQuinn, B., Macdonald, D.W., 2020. Levels of conflict over wildlife: understanding and addressing the right problem. Conserv. Sci. Pract. 2 (10), e259.