RENEW

Renewing biodiversity through a people-in-nature approach

ExCASES Mission

# Paws for Thought

## Towards environmentally friendly dog walking in the UK

University of Exeter

National Trust

UKRI Natural Environment Research Council

# Paws for Thought: An ExCASES mission

## Towards environmentally friendly dog walking in the UK

ExCASES is part of the RENEW project – a Natural Environment Research Council (NERC) funded partnership between the University of Exeter and the National Trust that takes a 'people-in-nature' approach towards the challenges of biodiversity renewal. The role of ExCASES is to undertake agile, focused work (which we term 'missions') on pressing biodiversity renewal issues. This report, with its supporting outputs, are outcomes of the ExCASES's mission, 'Paws for Thought'.

### Paws for Thought

**Adopting a standardised, holistic approach towards managing the impacts of dog walking on the environment in the UK**

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# Executive Summary

# 1. Executive Summary

**Dogs are important in the lives of many people in the UK, and dog walking is a popular activity that encourages people to exercise, providing physical and psychological benefits to them and their animals. Dog ownership is also positively associated with the amount of time people spend outdoors. However, the presence and behaviour of dogs can have adverse effects on wildlife and the environment, and with an estimated 12.5 million dogs in the UK this impact could be substantial. Managing interactions between dog walkers, wildlife, pets and livestock, habitats and other site users is a major priority for conservationists and land managers.**

This mission sought to collate evidence and appraise the impacts of dog walking on biodiversity in the UK. ExCASES conducted a rapid, semi-systematic evidence review which identified 43 pieces of evidence across 13 impact categories. In collaboration with stakeholders from the conservation, outdoor access and canine sectors, we interrogated this evidence in a series of participatory workshops, highlighting stakeholder needs and knowledge gaps, and providing a forum for sharing experience and best practice in managing interactions between people, dogs, and their wider environments.

Based on our evidence review and our mapping of the relationship between dog densities and protected habitats in England, negative impacts on the environment are likely from dog walking activity, and the scale of dog ownership means that they are widespread throughout the UK. Stakeholders call for a national conversation on this topic, and for a consistent, UK-wide approach towards communicating the issues and planning and implementing interventions. In response, we have produced separate guidance to support a holistic, systematic appraisal of coexistence issues, and advocate a standardised zoning approach to manage interactions. We have also produced an infographic, 'A Good Walk for All', to help communicate the impacts of dog walking on biodiversity, advocating three considerations to mitigate these impacts.

We emphasise that while we have highlighted impacts that will predominantly be interpreted as being negative, we do not wish to vilify dogs and their guardians. Dogs are our companions, many of us wouldn't want to be without them, and we wish to provide them with a rich and fulfilling life. We hope that the recommendations from this mission facilitate an evidence-based approach towards managing the impacts of dog walking, with emphasis on achieving health equity for people, dogs, wildlife and the environment.

## Based on the findings and outcomes of the Paws for Thought process, we make the following recommendations:

### 1 Adopt a holistic approach towards identifying effective, equitable solutions.

There is a diversity of stakeholder interests concerned with the interactions between people, dogs, wildlife and the environment across varying scales and contexts. These all interact with external social, ecological, economic and political factors. Achieving effective, equitable solutions within this complex space requires a holistic approach. That is why we recommend applying a One Health framework.

### 2 Adopt an evidence-based approach to managing interactions.

Fundamentally, we advocate an evidence-based approach to managing the interactions between people, dogs, wildlife and habitats. Paws for Thought collates evidence and contextualises this at the landscape scale, providing a foundation on which to build.

### 3 Build on the evidence and address the gaps.

Workshop participants highlighted knowledge gaps and expressed a need to better incorporate the socio-economic and cultural dynamics of dog ownership into the evidence base.

### 4 Communicate the impacts effectively

Participants perceived that awareness of wildlife and environmental impacts among dog owners and the canine sector was generally low, but that dog owners are receptive to messaging, and the issues are not too complex to understand if communicated effectively. Dog owners generally want to avoid negatively impacting wildlife and the environment; it is important not to blame or villainise when talking about potential impacts.

## 5 Adopt and promote a consistent, coherent approach towards interventions.

Variability in the approaches and quality of interventions that seek to manage interactions between people, their dogs, other users, wildlife and the environment leads to confusion for dog walkers, undermining the efficacy of interventions. A standardised national approach, based around zoning, is desirable and has widespread support amongst stakeholders. We provide guidance for practitioners and land managers in our accompanying report: 'Adopting a standardised, holistic approach towards managing the impacts of dog walking on the environment in the UK'.

## 6 Align the codes.

Numerous versions of 'canine codes' exist, which is confusing for dog owners. A simple, definitive code is required, to create consistency and clarity for dog owners.

## 7 Collaborate across sectors and disciplines.

Managing dog walking impacts involves multiple interested sectors and academic disciplines. Cross-sector collaboration and interdisciplinary research and expertise was highly valued by workshop participants.

## 8 Open a national conversation around sustainable coexistence between people, dogs, and the environment.

Our evidence review found that there are likely to be some adverse environmental effects from dog walking activities, and the current scale of dog ownership means that these impacts are likely to be widespread throughout the UK. Stakeholders felt that a national conversation was required to bring these issues to the fore.

# Mission Parameters and Purpose

# 2. Mission Parameters and Purpose

**ExCASES is part of the RENEW project – a Natural Environment Research Council (NERC) funded partnership between the University of Exeter and the National Trust that takes a 'people-in-nature' approach towards the challenges of biodiversity renewal. The role of ExCASES is to undertake agile work (which we term 'missions') on pressing biodiversity renewal issues. The work can consist of original research, participatory process, and the synthesis of existing knowledge, with the aim of creating impactful outputs for real change. The ExCASES approach is based on collaboration across disciplines and sectors, co-design with stakeholders, and agile delivery. This report is one of the outputs from ExCASES's mission, 'Paws for Thought'.**

Paws for Thought collated evidence from the academic and grey literature on the impacts of dog walking on wildlife and the environment. This evidence formed the basis for engagement and collaboration with a wide group of stakeholders through a deliberative, participatory process. During this process we used the technical information from the evidence review in conjunction with practitioner knowledge and experience to identify key problem areas and effective intervention strategies. We explored the needs and expectations of different users and conceptualised a holistic approach towards tackling the issues, prioritising efficacy, sustainability, and equitability. The outputs from this mission seek to support stakeholders who are working at the interface between people, dogs, and wildlife, and to aid in planning and executing strategies that promote a fair coexistence between people, dogs, wildlife and wider ecosystems. There are two additional outputs that support this mission report:

i) Guidance for adopting a standardised, holistic approach to managing the impacts of dog walking on the environment in the UK.

ii) Our 'Good Walk for All' infographic, to support responsible dog walking behaviour wildlife and the environment.

# Background

# 3. Background

Dog walking is a popular activity; it is reported that approximately one third of all visitors to the countryside in the UK are accompanied by a dog (Edwards & Knight, 2006). Dog ownership encourages people to exercise, and walking can lead to physical, social and psychological benefits (Westgarth *et al*., 2019; Harvey *et al.*, 2024). The bond between owners and their dogs is often so strong that dogs are considered an important part of the family. The strength of these relationships can influence attitudes and beliefs towards wildlife, as the ownership of a pet is positively associated with a person's appreciation, understanding, and feelings of connectedness towards nature (Nisbet et al. 2009). With one dog for every five people in the UK (Statista 2023), the benefits of dog ownership for people's wellbeing is likely significant.

However, dogs can cause discomfort or fear for some people, foul in public areas, and the impacts of domestic dogs on wildlife are recognised as a major global conservation issue (Hughes and Macdonald, 2013; Young et al., 2011; Doherty *et al.*, 2017). The main concern about the impacts of dogs on wildlife is associated with free-ranging dogs and packs of dogs, which is not typical of the context in the UK. Globally, domestic dogs are the most numerous carnivore and can negatively impact wildlife through direct predation (Ritchie et al., 2014), fear-mediated behavioural changes (Banks and Bryant, 2007; Zapata-Ríos and Branch, 2016), competition (Vanak et al., 2014), harassment (Weston and Stankowich, 2014), hybridisation (Bassi et al., 2017), and disease transmission (Furtado et al., 2016). Additionally, research and anecdotal reports have shown that dogs contribute to nutrient enrichment of infertile habitats through defecation and urination (Taylor et al., 2005), and that dog faeces can carry neonicotinoids, avermectin (a worming chemical that can impact invertebrates), and parasites that affect grazing animals (neosporosis for cattle; sarcocystosis for sheep). Globally, it is anticipated that the scale and urgency of these issues are likely to be exacerbated as the human population expands geographically and increases by a projected 2.3 billion (to 9.7 billion) by the year 2050 (United Nations, 2017).

Despite global trends indicating an overall negative effect on wildlife, the impacts of dogs are not universal, but context specific (Gompper 2021). A small but growing body of literature has failed to discern the impact of dogs on a variety of wildlife species (e.g., Parsons *et al*., 2016), and there is taxonomic bias in the research of impacts towards mammals and birds, with little known about interactions between dogs and reptiles, amphibians, invertebrates and plants. In some contexts, and settings, negative interactions with wildlife might be of limited concern (Gompper 2021).

Negative impacts associated with free ranging and feral dogs, and dogs on walks, have been quantified for c100 species globally (Bellard *et al*., 2016; Doherty et al., 2016), which on review was proposed as an underestimate (Doherty *et al*., 2017). Species are more likely to be negatively impacted if their populations are reduced in size and distribution, lack sufficient micro-habitats to provide refuge and/or are naïve or vulnerable to native canid species (e.g., foxes; Gompper 2021). These criteria, particularly the first two, can arguably be applied to numerous species of conservation concern in the UK; notably amphibians, reptiles, ground nesting birds, and shorebirds, where habitat reduction, alteration, and fragmentation are already known causes of population declines (State of Nature Partnership 2023). In this context, additional impacts from predation and/or disturbance by dogs could significantly affect population viability (e.g., for stone curlew Burhinus oedicnemus; Taylor *et al*., 2007).

In the UK, despite being predominantly accompanied by people, dogs are often walked off lead with a degree of autonomy from their owners. The perceived impacts of dogs on biodiversity are therefore an important concern for UK conservationists (e.g., The Guardian, 2023). Natural England, the National Trust and the Wildlife Trusts have all produced guidance for reserve managers on mitigating the impacts of dogs, sometimes entirely prohibiting access to particularly sensitive areas, whilst the National Trust are just one of numerous organisations that have a canine code, which outlines a code of conduct for responsible dog ownership on NT properties (Visiting Trust places with your dog | National Trust). A wide range of stakeholders have taken a diversity of approaches to managing dogs and engaging dog owners over issues of disturbance and this is a priority for most land managing and conservation organisations, who often work in collaboration with local authorities and charities in the pet sector (e.g., The Dogs Trust and The Kennel Club). However, there appears to have been limited sharing of knowledge and best practise when it comes to evidencing impacts, or the efficacy of different intervention strategies, both between organisations and between these stakeholders and dog walkers.

Local engagement and community support are often key to successful dog management programs (Doherty *et al*. 2017). However, many people have strong belief systems regarding how dogs should behave and be managed, with associated low compliance with regulations designed to limit the impacts of dogs (Villatoro et al. 2019; Guinness et al. 2020; Schneider et al. 2020), and particularly recommendations around keeping dogs on leads. The academic literature and early scoping conversations with National Trust and The Wildlife Trusts additionally suggested great variability around the efficacy of methods such as signage, zoning of access, and exclusion of dog walkers at certain times of the day or season. Anecdotally, from conversations during the scoping phase (Section 3, fig 5), low compliance was believed to be linked to lack of awareness among dog owners about the potential impacts of dogs on wildlife (and specifically about the species impacted), but also resistance to what is perceived as an imposition of external authority in ways that limit an important activity for people and their dogs. Judgements around the acceptability of impacts based on a hierarchical valuing of nature were also purported to be an issue (people being more mindful of birds and mammals, for example, compared to invertebrates, plants and amphibians). There is also an apparent lack of dialogue between site managers and dog walkers about their respective expectations and needs in terms of how one should behave with one's dog(s) in nature reserves and protected areas.

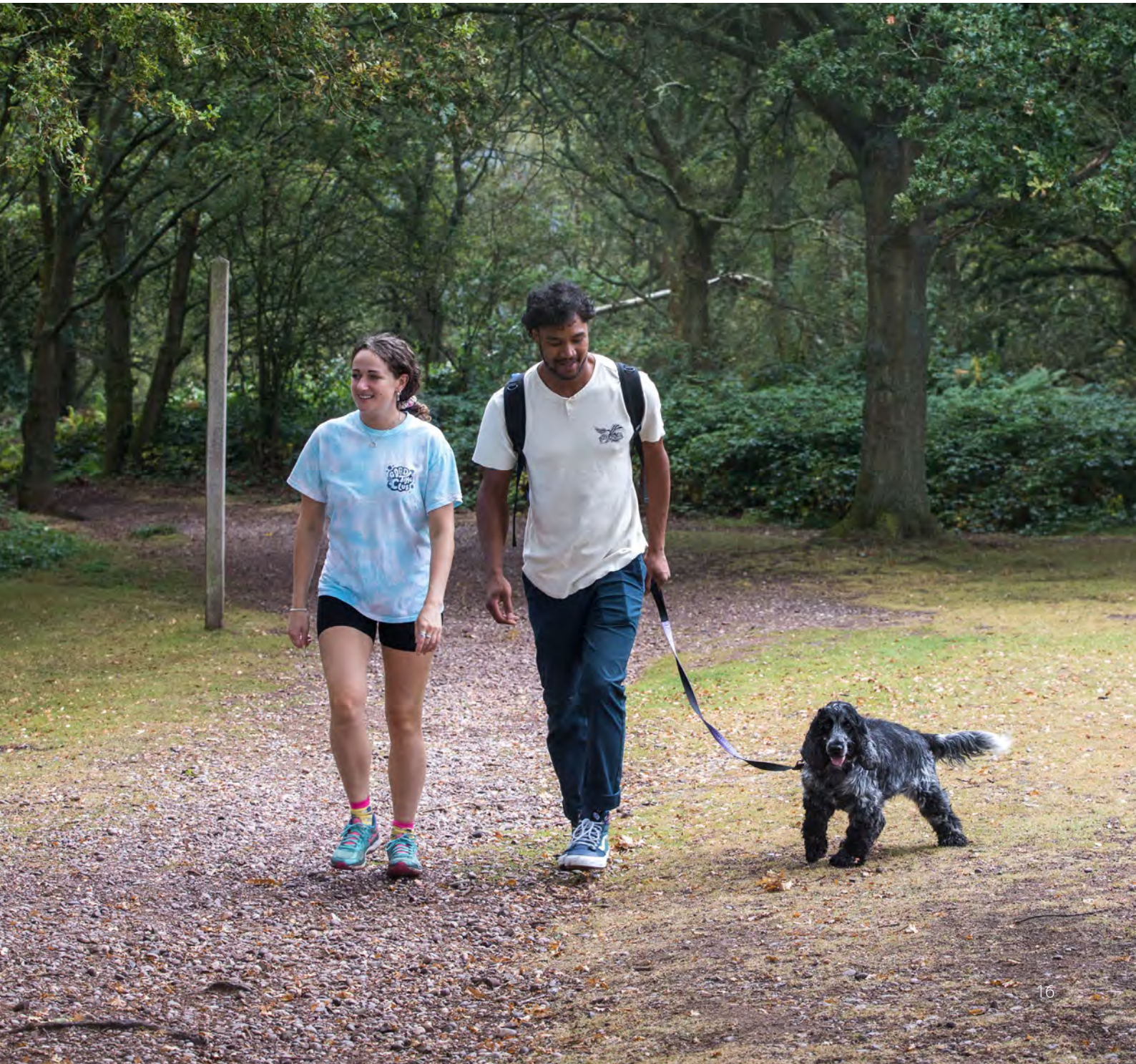
In response to the needs of stakeholders, we undertook an ExCASES mission to explore the evidence of the impacts of dog walking on biodiversity in the UK, and to engage with and convene a variety of stakeholders across different sectors in a participatory process, with the objective of seeking pathways to support a more sustainable relationship between people, dogs, and the environment.

# Methods

# 4. Methods

## 4.1 The ExCASES approach

The design and delivery of this mission was led by the lead author, one of three Postdoctoral Research Fellows (PDRFs) based on the RENEW project and was accountable to the two Leads/Co-Investigators of the ExCASES team, Professor Matthew Heard (Head of Environmental Research and Data at the National Trust) and Dr Sarah Crowley (Senior Lecturer in Human and Animal Geography at the University of Exeter). While the National Trust (NT) is a large landowning heritage and conservation NGO with a 'Dogs Welcome' strand of work, it is also an Independent Research Organisation (IRO), working in partnership on the RENEW project with the University of Exeter. The project was therefore subject to ethical review by the Faculty of Environment, Science and Economy, Cornwall Ethics Committee at the University of Exeter.



## 4.2 Mission Aims

- To establish an evidence base from secondary analysis of the literature, and share knowledge among stakeholders, regarding dog impacts on wildlife and the environment, and management of dogs on walks
- To facilitate holistic discussions amongst stakeholders about the interactions between people with their dogs, wildlife, and wider ecosystems.
- For stakeholders to share learning and experience from best practise, and to broaden their understanding of each other's expectations and needs with regards to biodiversity conservation, human wellbeing and dog welfare.
- To inform sustainable solutions that could mitigate (evidenced) negative impacts of dogs on biodiversity.

## 4.3 Key Research Questions

- What is the evidence of impacts of walking dogs on wildlife and the environment in the UK, and how does this evidence correspond with different stakeholders' perceptions of the impacts?
- What are understood to be the most effective mitigations and interventions to prevent or minimise the impacts of dogs on wildlife and the environment (considering different types of land use, habitats, and priority species) in the UK?
- What are the needs and expectations of different stakeholders around how dog owners and their dogs should behave in nature reserves and protected areas? Where do these needs and expectations converge and diverge, and how equitable are preferred intervention methods for different stakeholders?

## 4.4 Stakeholder identification and engagement

The mission design and engagement process are highlighted in Figure 5. Stakeholders in the land management, conservation, and canine sectors were identified during the early stages of scoping and co-design with the National Trust, RENEW, and the Wildlife Trusts (Feb-March 2024). Additional stakeholders were identified from exploration of the literature, and then iteratively by snowballing during the process of stakeholder engagement (March-May 2024). Stakeholders were approached by email by the lead author, which usually led to a scoping conversation online or an exchange of information over email. Scoping conversations were held with stakeholders highlighted in figure 1. These conversations explored stakeholder's knowledge, experience and perceptions of the impacts of dog walking (positive and negative); their organisations priorities in relation to dog walking and conservation; what kinds of interventions they were aware of, and/or employed; what they perceived as best practise; and what their aspirations were in relation to sustainable access and interactions between people, dogs and wildlife. These conversations helped to identify literature/reports, additional stakeholders, and informed the design and delivery of the participatory workshops.

## Rapid Evidence Review

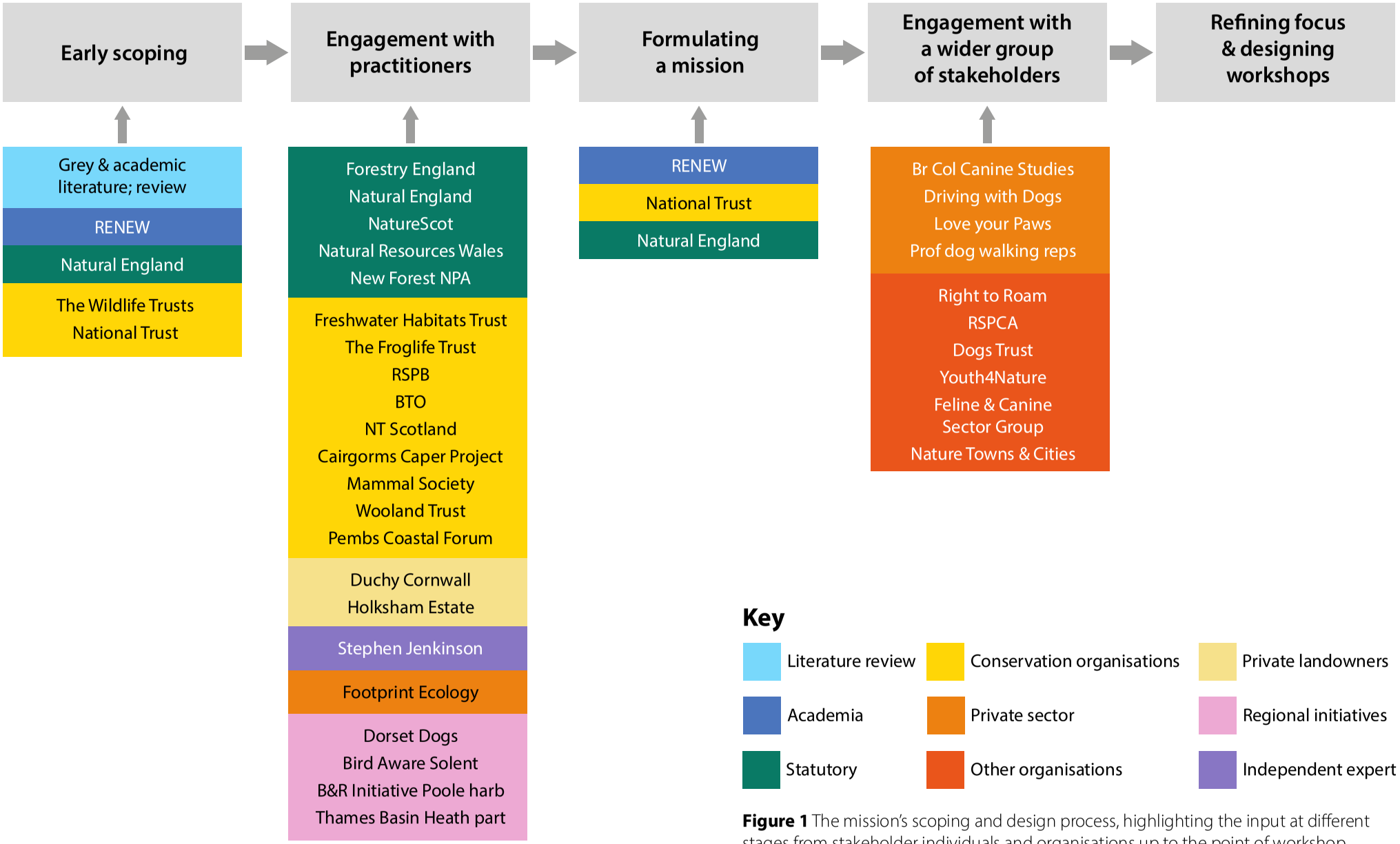



**Figure 1** The mission's scoping and design process, highlighting the input at different stages from stakeholder individuals and organisations up to the point of workshop design and delivery. Colours represent groups of key perspectives identified in scoping phase and iteratively over the course of initial engagement.

# Evidence Review

# 5. Evidence Review

**ExCASES conducted a rapid, semi-systematic evidence review of the impacts of domestic dogs on biodiversity in the UK. The review identified 43 pieces of evidence across 13 impact categories (Tables 1 & 2, Fig 1).**

The review primarily involved a literature search using Web of Science and Google Scholar. The search was parametrised to exclude studies relating to free ranging/roaming dogs, and wild/feral dogs, which were not thought relevant for the UK context, where the great majority of dogs are associated with an owner and are accompanied on walks. The results were then filtered manually to exclude studies from outside the UK, but exceptions were made for studies in comparable socio-ecological contexts outside of the UK, and for studies from other countries that reported findings for species found within the UK. There were two exceptions to these criteria: 1) a study reporting the effect of dog barking on the behaviour and physiology of howler monkeys in Mexico (the physiological response to a stressor is comparable across mammals; Reeder & Kramer, 2005), and 2) a study reporting the impacts of recreational disturbance on a butterfly (the Karner blue) in North America (based on an appraisal of relevance, and given that no other studies had reported impacts on butterflies in the UK).

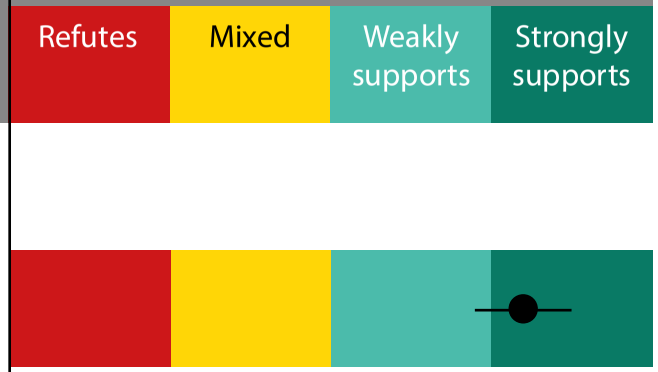
Grey literature and reports were identified by Google search using the same terms as the Web of Science and Google Scholar searches, and iteratively from recommendations made by stakeholders over the course of the process. All the evidence was collated in a database, and summary information was produced for use with stakeholders in the participatory workshops. We appraised the strength of evidence associated with the reported impacts using the Balanced Evidence Appraisal Method (BEAM, Fig 2; [1]Christie *et al*., 2023). BEAM was developed as an intuitive approach towards appraising the balance of evidence of an assumption when the situation being explored is complex, the types of evidence are diverse (e.g., evidence from scientific literature, reports, anecdotal accounts, opinion pieces etc), and the assumption requires analytical, deliberative and cognitive appraisal. We have produced summary figures to highlight the distribution of evidence across the impacts, and the taxa and habitat focus of studies (Fig 3).

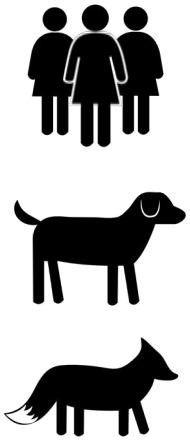
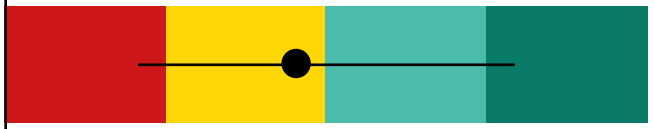
We did not cover the socio-economic and cultural impacts of dog walking (both positive and negative) nor the carbon or wider environmental footprint of keeping and feeding a dog. We recognise that these encompass important considerations for conservation, such as interactions with livestock and people's access to and enjoyment of greenspace. We did, however, explore some of these aspects with stakeholders during two participatory workshops as part of the mission.

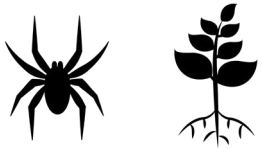
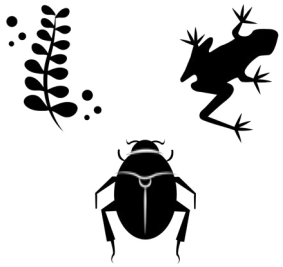
The following table presents a summary of the impacts identified from our rapid evidence review. It presents the identified impact with the number of pieces of supporting evidence, and links to the references; a topline summary of that impact and key points from the evidence; the taxonomic group studied/affected; and a visual showing the balance of evidence.

**Table 1** A summary of the rapid evidence review of the academic and grey literature. The review identified 13 different types of impact. These are presented with the number of contributing pieces of evidence; a topline summary of the impact and key points from the evidence; the taxonomic group studied/affected; and the outcome of a Balanced Evidence Appraisal Method (BEAM; Christie et al., 2023). BEAM was developed as an intuitive approach towards appraising the balance of evidence of an assumption when the situation being explored is complex, and the types of evidence are diverse. BEAM appraises where the balance of evidence lies for each assumption, which in this case, are the topline evidence summaries for the impacts.

| **Impact** (no. pieces of contributing evidence & references) | **Evidence summary** | **Taxa studied** | **BEAM outcome** (balance of evidence) |
|---|---|---|---|
| | | | Refutes / Mixed / Weakly supports / Strongly supports |
| **Displacement of wildlife (n=17)**<br><br>5, 6, 7, 11, 14, 17, 20, 21, 22, 24, 25, 26, 27, 29, 36, 37, 39 | *The presence of people and dogs can negatively affect the distribution of wildlife, excluding them from their preferred habitats.*<br>• Disturbance by people and their dogs can exclude wildlife from their preferred sites for foraging, nesting, and resting, which can have impacts at the population level, in terms of abundance and distribution.<br>• However, several studies suggest that wildlife can become habituated to, or tolerant of disturbance, demonstrating a mediated response to people and dogs. |  |  |
| **Shedding flea and parasite treatments (n=4)**<br><br>15, 31, 32, 42 | *Spot-on flea and parasite treatments can enter freshwater habitats, exposing wildlife to harmful insecticides.*<br>• Fiprinol and imidacloprid pesticides, which are used in parasite treatments, are toxic for invertebrates and vertebrates.<br>• They can be shed from, or washed off dogs, and find their way into aquatic ecosystems. The greatest sources of transmission are from bathing dogs after treatment, and from owners washing their hands - imidacloprid and fiprinol are detectable from hand washing 28 days after a treatment.<br>• This is a UK-wide issue, and is most acute near densely populated areas, and within 2km of wastewater treatment plants, where concentrations of fiproles can greatly exceed toxicity limits.<br>• However, there is uncertainty over the bioavailability of these compounds (the extent and rate at which the compounds enter the bodies and systems of wildlife in freshwater). |  |  |

| Impact (no. pieces of contributing evidence & references) | Evidence summary | Taxa studied | BEAM outcome (balance of evidence) |
|---|---|---|---|
| **Species richness (n=4)**<br><br>7, 8, 11, 35 | *Disturbance by dogs can reduce species richness, i.e., the number of species present*<br>• Through physical disturbance and damage to vegetation, dogs can simplify habitat structure and niche availability, reducing species diversity, particularly in comparatively enclosed spaces such as ponds.<br>• Concentrated excretion of waste may alter terrestrial floral diversity through eutrophication.<br>• There is evidence (from France) that even low levels of disturbance can lead to a reduction in the abundance and diversity of forest birds. |  |  |
| **Nutrient enrichment from faeces and urine (n=4)**<br><br>7, 8, 11, 35 | *Consistent exposure to dogs can change vegetation species assemblages by eutrophication.*<br>• Eutrophication from dog urine and faeces can significantly increase soil fertility, though the effect is likely localised to areas of consistent use.<br>• In these areas of consistent use, soil nitrogen and phosphorus are elevated, which can lead to changes in the floral community - particularly when the native flora prefers acidic soil. |  |  |
| **Physiological stress response (n=4)**<br><br>4, 13, 34, 38 | *Disturbance by dogs can cause an elevated physiological stress response in wild animals*<br>• Anthropogenic disturbance (people, or domestic dogs associated with people) can cause an elevated physiological 'stress' response for individual animals.<br>• Acute stress is part of an adaptive 'fight or flight' response, but persistent disturbance can cause chronic stress, which can undermine fitness and survival. |  |  |

| Impact (no. pieces of contributing evidence & references) | Evidence summary | Taxa studied | BEAM outcome (balance of evidence) |
|---|---|---|---|
| **Disease transmission (n=5)**<br><br>1, 9, 12, 23, 40 | *Dogs can be vectors for several important diseases, facilitating their transmission between wild animals, the environment, and people*<br>• Dogs can be vectors for several important pathogens (Canine Distemper Virus, Leishmania sp, and Toxoplasma sp), potentially transmitting them to, and receiving them from, wild animals.<br>• In urban areas with fox populations, there is the potential for transfer of helminths (parasitic worms) between dogs and foxes, and then between dogs and contaminated environments, to people.<br>• Dog faeces represent a widespread contaminant of public parks, with the potential for transfer of Toxocara (round worm) to people. The severity of contamination is variable across locations, but the issue is prevalent and widespread across the UK and Ireland.<br>• For bathing water, even small amounts of dog faeces can contaminate large areas to the point where they fail bathing water compliance tests. |  |  |
| **Nest success (n=10)**<br><br>2, 16, 18, 19, 21, 22, 26, 27, 28, 30 | *Disturbance by dogs can reduce hatching success and chick survival for ground nesting birds*<br>• Disturbance in of itself does not necessarily impact nest success. However, disturbance can operate synergistically with other environmental variables (e.g., inclement weather, sub-optimal habitat, and exposure of nests to predation) to reduce hatching and chick survival.<br>• The severity of impacts can increase with increased frequency of disturbance events.<br>• Some studies report disturbance but no impact on nest success or fledgling survival, whilst there is evidence of density dependent effects, where birds that select disturbed sites have higher nest success and reproductive output through reduced competition. |  |  |

| Impact (no. pieces of contributing evidence & references) | Evidence summary | Taxa studied | BEAM outcome (balance of evidence) |
|---|---|---|---|
| **Physical disturbance of terrestrial flora (n=1)**<br><br>8 | *Regular use by dogs can alter vegetation structure through trampling, reducing structural heterogeneity*<br>• Regular use by dogs can potentially affect vegetation structure through trampling, reducing structural heterogeneity.<br>• In the contributing study (an urban dry grassland), this had no effect on endangered species or sand lizards, but decreased spider diversity, and was associated with the increased occurrence of invasive species. |  |  <br>*Less than 4 pieces evidence |
| **Physical disturbance of ponds (n=2)**<br><br>11, 42 | *Dogs can reduce species abundance and diversity in ponds through physical disturbance*<br>• Dogs can reduce species abundance and diversity in ponds through physical disturbance, by trampling vegetation, amphibian spawn, and stirring up sediment.<br>• This can displace wildlife, negatively impact the reproduction of invertebrates and amphibians, and reduce taxa diversity. |  |  <br>*Less than 4 pieces evidence |
| **Disturbance from barking (n=2)**<br><br>33, 34 | *Wild animals react to barking in the same way they would react to the presence of a predator*<br>• Dog barking can elicit predator avoidance responses from wildlife, though there is the potential for habituation in some contexts (e.g., coots in an urban wetland).<br>• For howler monkeys, barking elicits an escape response and an acute physiological stress response, where the strength of response is positively correlated to the intensity and proximity of the barking. |  |  <br>*Less than 4 pieces evidence |

| Impact (no. pieces of contributing evidence & references) | Evidence summary | Taxa studied | BEAM outcome (balance of evidence) |
|---|---|---|---|
| **Adder predation (n=1)**<br><br>43 | *Dogs are a predator of adders on heathland*<br>• Dogs were the most common predator of model adders on managed and unmanaged heaths.<br>• The frequency of attacks significantly increased closer to paths and were more frequent on heaths with higher numbers of dog walkers.<br>• Of 770 model adders deployed over 10 days, 26% were attacked - the majority by dogs.<br>• It is not clear whether other carnivores, e.g., foxes, might have been responsible for some attacks. |  |  <br>*Less than 4 pieces evidence |
| **Vector for invasive species (n=2)**<br><br>8, 11 | *Dogs can facilitate the spread and establishment of invasive species*<br>• Dogs can facilitate establishment of invasive species by carrying seeds or fragments of plants between locations and creating openings for these species through their disturbance of the existing vegetation.<br>• This can occur in both terrestrial and aquatic habitats. |  |  <br>*Less than 4 pieces evidence |
| **Coprophagia - animals eating dog faeces (n=1)**<br><br>41 | *Dog faeces can be a source of food for wild animals*<br>• Dog faeces potentially represent a calorific source of food for wildlife, which can provide a predictable alternative to wild prey, or provide a source of food when preferred prey is scarce or unavailable.<br>• The ecological effects of this are unknown; the contributing study, from native woodland in the Cairngorms National Park, reports that dog faeces represent a potentially significant source of calories for foxes. |  |  <br>*Less than 4 pieces evidence |

## Well replicated studies

**1** The presence of people with dogs can negatively affect settlement patterns and selection of habitat for wildlife (n=17)

**2** Spot-on flea and parasite treaments can enter freshwater habitats, exposing wildlife to harmful insecticides (n=4)

**3** Disturbance by dogs can reduce species richness, i.e., the number of species present (n=4)

**4** Consistent exposure to dogs can change vegetation assemblages through eutrophication (n=4)

**5** Disturbance by dogs can cause an elevated physiological stress response in wild animals (n=4)

**6** Dogs can be vectors for several important diseases, facilitating their transmission between wild animals, the environment, and people (n=5)

**7** Disturbance by dogs can reduce hatching success and chick survival for ground nesting birds (n=10)

## Poor Evidence: more studies required

**8** Regular use by dogs can alter vegetation structure through trampling, reducing structural heterogeneity (=1)

**9** Dogs can reduce species diversity and abundance in ponds through physical disturbance (n=2)

**10** Wild animals react to barking in the same way they would react to the presene of a predator (n=2)

**11** Dogs are a predator of adders on heathland (n=1)

**12** Dogs can faciliate the spread and establishment of invasive species (n=2)

**13** Dog faeces can be a source of food for wild animals (n=1)

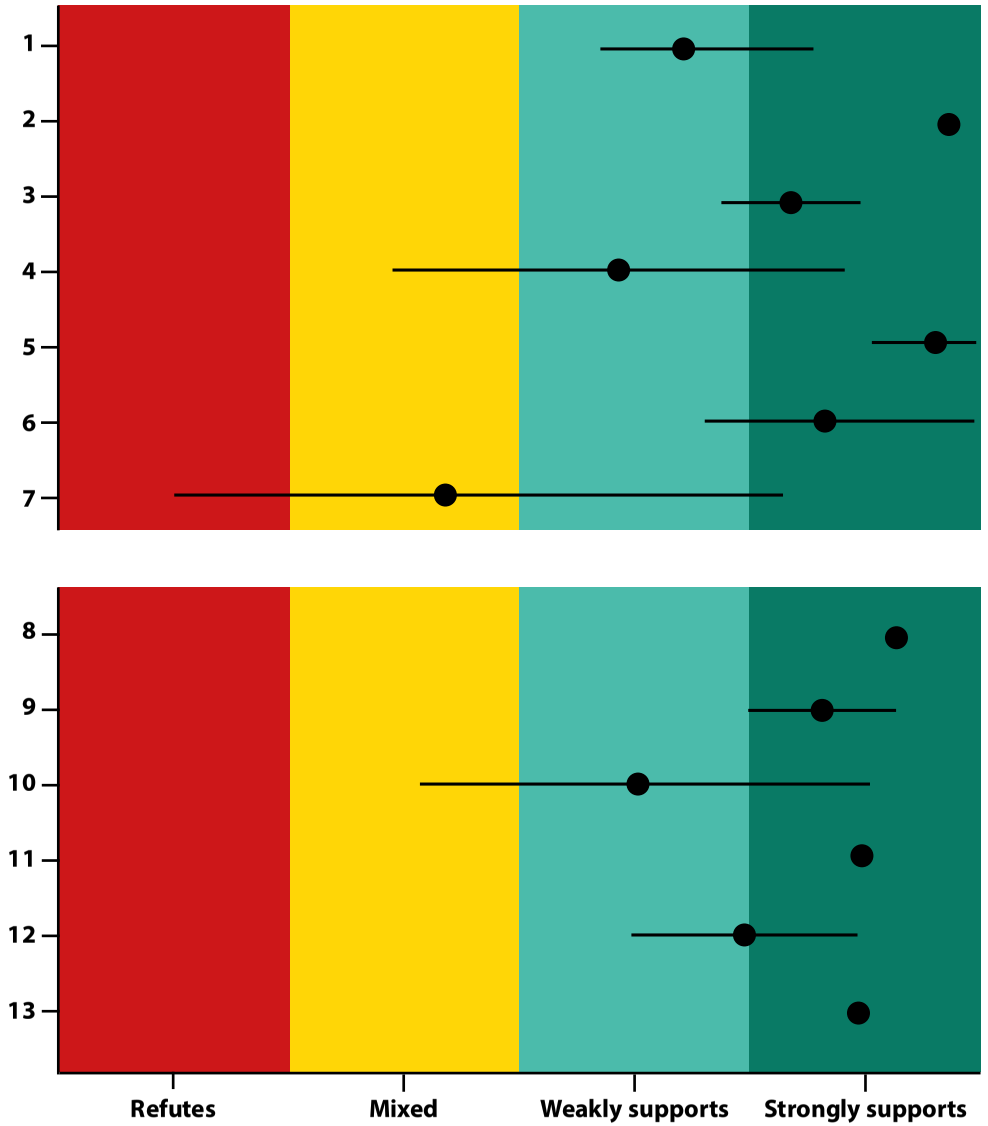
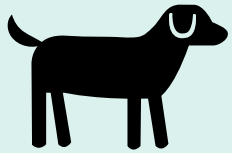



**Figure 2** Results of the assessment of the weight of evidence supporting or refuting the identified impacts using the Balanced Evidence Appraisal Method. The top section of the graph highlights impacts (1-7) for which there are four or more pieces of contributing evidence (the number of contributing pieces of evidence for each impact are in parentheses). The impacts in the lower section (8-13) have less than four pieces of contributing evidence. The solid dots highlight where the balance of evidence lies for each impact (across the x-axis, ranging from 'refutes' to 'strongly supports'), with their variance (the solid lines). The numbers on the y-axis correspond to the impacts on the left of the figure.

**Table 2** A summary of the reported impacts for different groups, ordered a-l by the number of associated impacts.

| | | | |
|---|---|---|---|
| **Birds**  | • Displacement of wildlife<br>• Shedding flea and parasite treatments<br>• Species richness<br>• Physiological stress response<br>• Nest success<br>• Disturbance from barking | **Mammals**  | • Displacement of wildlife<br>• Physiological stress response<br>• Disease transmission<br>• Disturbance from barking |
| **Terrestrial plants**  | • Species richness<br>• Disturbance of terrestrial flora<br>• Vector for invasive species | **Aquatic invertebrates**  | • Shedding flea and parasite treatments<br>• Species richness<br>• Physical disturbance of ponds |
| **Aquatic plants**  | • Species richness<br>• Physical disturbance of ponds<br>• Vector for invasive species | **Amphibians**  | • Shedding of flea and parasite treatments<br>• Species richness<br>• Physical disturbance of ponds |
| **Spiders**  | • Species richness<br>• Disturbance of terrestrial flora | **Fish**  | • Shedding of flea and parasite treatments |
| **Butterflies & moths**  | • Displacement of wildlife | **Reptiles**  | • Adder predation |
| **Humans**  | • Disease transmission | **Domestic dogs**  | • Disease transmission |

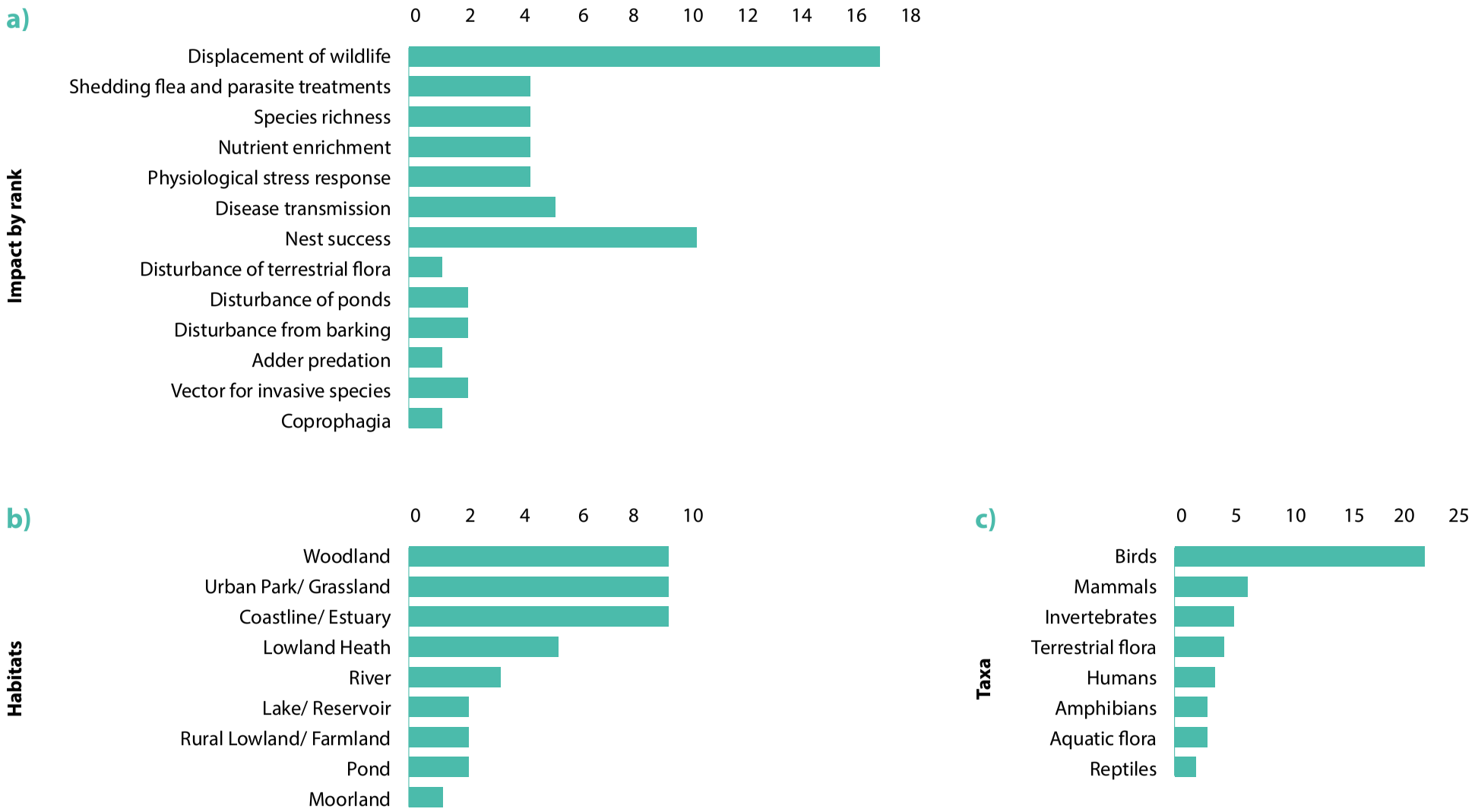
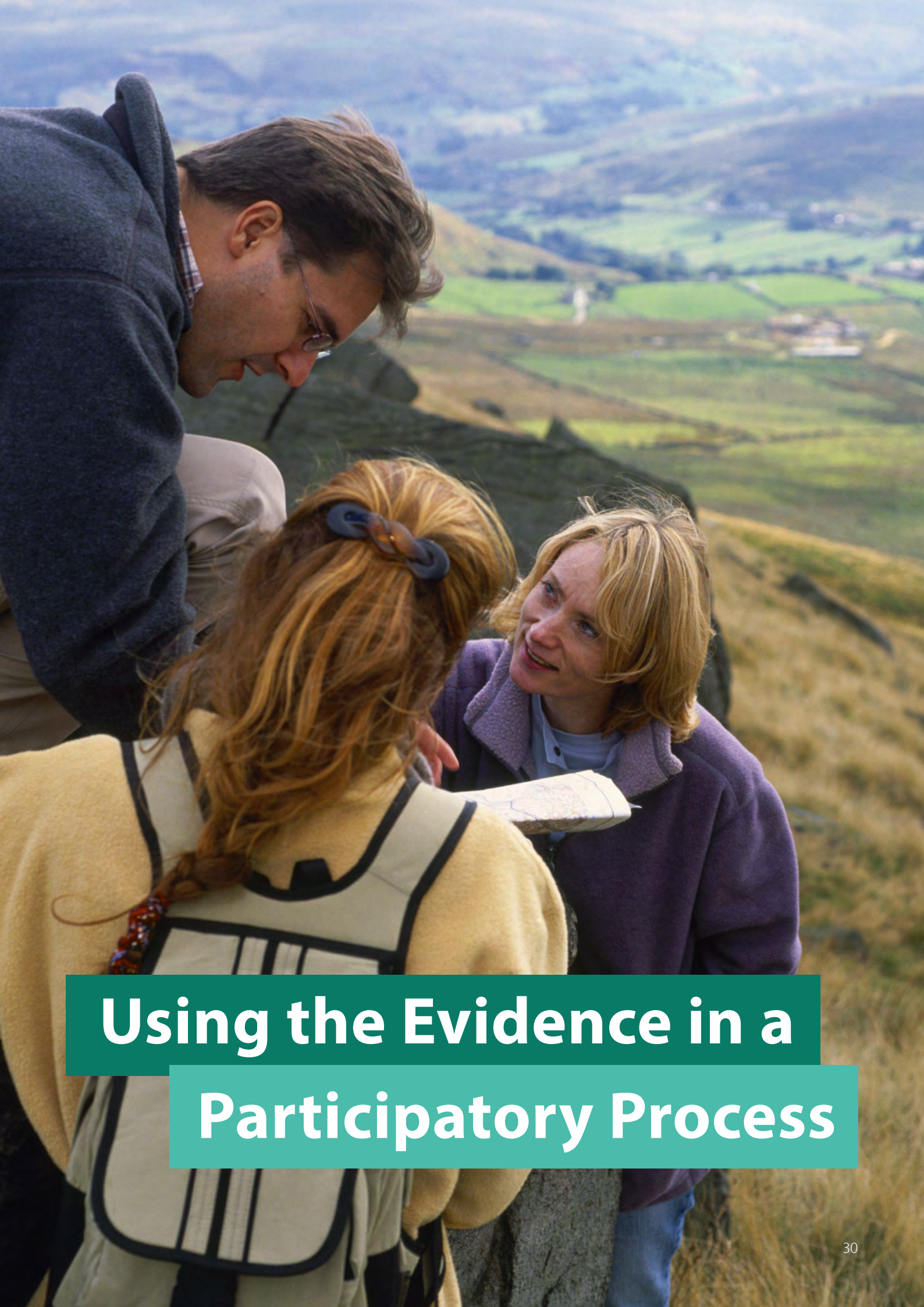



**Figure 3** The distribution of evidence across a) the impacts identified from the rapid evidence review, as ranked by workshop participants in terms of their perceived importance for biodiversity conservation (highest to lowest), b) the types of habitats studied, and c) the taxonomic groups impacted. The number of pieces of evidence is displayed on the horizontal axis (x-axis).



# Using the Evidence in a Participatory Process

# 6. Using the Evidence in a Participatory Process

**Details on workshop design, data analysis, and participating organisations can be found in Appendix I.**

## 6.1 Workshop 1

**Workshop 1 was targeted at conservation practitioners and researchers working on dog walking and biodiversity conservation, with the following objectives:**

I. To appraise the evidence: What is known, based on evidence and experience, about the interactions between dogs and biodiversity, and where are the knowledge gaps? How representative is the evidence of stakeholder's perceived priorities?

II. To explore opportunities: What is working on the ground in terms of managing the interactions between dogs and the environment? How can we learn from best practise, and empower what is working at different scales?

III. To seek optimal interventions: What are our preferred interventions for managing negative impacts? What support is required to action effective interventions? What are the different expectations and needs of people and their dogs, other users, and wildlife – where and how do these needs intersect?

Participants familiarised with the evidence from our rapid evidence review. We explored the evidence together and undertook activities to identify knowledge gaps, and to prioritise the identified impacts in terms of their perceived importance for conservation. We then undertook an activity which allowed participants to contribute their knowledge, experience, and innovative ideas towards interventions to mitigate and manage impacts. Finally, we undertook an activity to explore a holistic, One Health approach towards identifying the needs of different populations and managing interventions.

## 6.2 Workshop 2

Workshop 2 was targeted at stakeholders from the canine sector, and practitioners working on public and community engagement around access and recreation. The workshop had the following objectives:

**I. Appraise the evidence:** What do we know, based on evidence and the experience of land managers, about the interactions between dogs and the environment? How aware do we think our respective communities are of these impacts?

**II. Exploring our expectations and needs:** what are the needs of different stakeholders (including wildlife and habitats) in relation to dog walking? Do land managers' preferred interventions work for dog owners/walkers? How can we ensure that management decisions are equitable – that they are considerate of people, dogs and biodiversity?

**III. Seek pathways forwards:** How can land managers and dog owners/walkers best work together to promote a healthy, sustainable relationship with the environment?

We presented the evidence from our review, and reflected on this with participants, undertaking a ranking activity to explore their perceptions of the levels of awareness towards the impacts within the canine sector and dog owning community. We then explored the expectations and needs of different stakeholders, wildlife, and habitats, with an emphasis on holistic appraisal. Finally, we shared the input from participants in Workshop 1, around preferred interventions, and explored how different stakeholders could work better together to maximise compliance, efficiency, and equitability when employing interventions.

## 6.3 Workshop 3

Regulation and licensing emerged as an intervention approach during Workshops 1 and 2, mainly in relation to commercial dog walkers and trainers, but also for dog owners. This was the most divisive topic discussed, with some organisations feeling that some form of licensing was necessary and would deliver benefits, whilst others felt that licensing was either not feasible, not fair, or not desirable (or all three), and that initiatives focussing on positively reinforced behavioural change were achieving success without enforcement.

It was felt that the discussion needed further attention. We therefore followed up the two in-person workshops with a specific online session to gather and share participant's views, synthesising the pros/opportunities and cons/challenges.

# Workshop Outcomes & Mission Outputs

# 7. Workshop Outcomes & Mission Outputs

There was a strong consensus within both workshops of the value of convening stakeholders to collectively appraise the evidence, establish new connections and consolidate existing ones, and to share best practice. Participants in Workshop 1 (conservation practitioners) were generally aware of most of the impacts discussed, but not necessarily the details or where the balance of evidence lay for each impact. Participants in Workshop 2 (from the conservation, access, and canine sectors), notably those working in the canine sector, found the evidence particularly eye opening.

Knowledge around best practice was shared and generated in both workshops. Practitioners broadly felt that the conservation community has the tools, currently, to mitigate impacts, but that there is a lack of cohesiveness and consistency in practice and policy which causes confusion and undermines the efficacy of interventions. Participants in Workshop 2 concurred with this, expressing confusion around the different guidance and codes associated with different conservation and land managing organisations. **There was consensus in both workshops that a more coherent, consistent, national approach towards communicating the impacts and implementing interventions would lead to greater efficacy of interventions and adherence to guidance among dog walkers.**

## 7.1 Mission Outputs

In response to the needs of stakeholders, alongside this mission process report we have produced two additional outputs.

### I) Guidance for adopting a standardised, holistic approach towards managing the impacts of dog walking on the environment in the UK

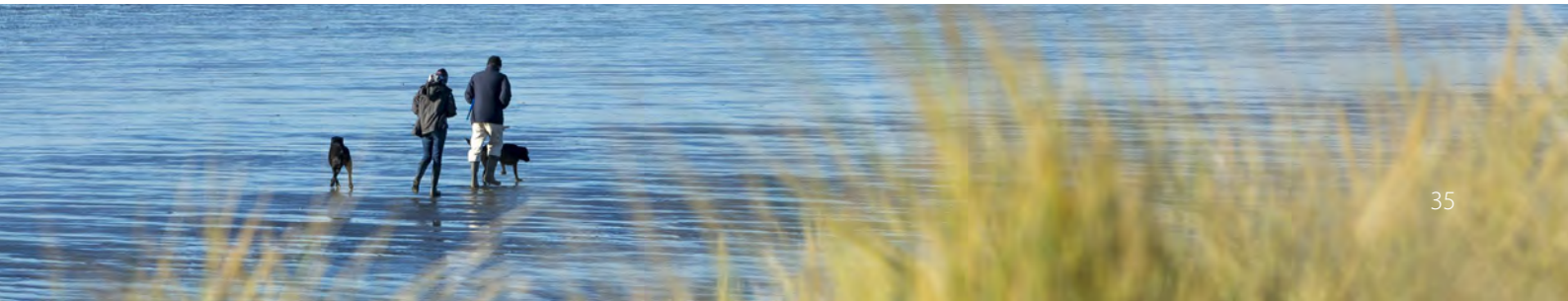
This guidance is aimed at stakeholders involved in the planning and implementation of interventions. The guidance orientates around a central recommendation to adopt a standardised and holistic approach towards identifying and managing coexistence issues between people, dogs, wildlife and the environment. In the guidance we recommend a three-phase approach to achieve this:

**Phase 1** **Gather evidence to understand the potential range and nature of environmental impacts and how these may be affected by landscape context.**

**Phase 2** **Undertake a setting-based appraisal of the needs of different users (e.g., using our One Health framework).**

**Phase 3** **Group suites of appropriate intervention methods to create clear 'zones' where activities can be undertaken, based on a traffic light system with pawprint icons.**

Following this guidance enables stakeholders to thoroughly appraise a situation and create intervention strategies that are both effective and equitable. This guidance has been produced as a separate output.



### II) A 'Good Walk for All' infographic

We have produced 'A Good Walk for All' infographic in response to a perceived need to incorporate evidence-based information of the impacts of dog walking into guidance and communications around responsible dog walking behaviour. Numerous responsible dog walking guides exist; we have assimilated the guidance of the 'top performers' in the conservation and canine sectors, as perceived by workshop participants, into an infographic with three key principles: 1) Keep your pack together, 2) Respect others' needs, and 3) Leave nothing behind.

What makes A Good Walk for All different is the inclusion of information on the evidenced impacts of dog walking on the environment, and linking these to the three key behavioural practices that can mitigate impacts. Our aim is to empower people with the information they need to be aware and responsible, and to walk their dogs in a way that meets, respects, and protects the needs of their dogs, other people, wildlife and the environment. A Good Walk for All has been produced as a separate output, and is free for use.

## 7.2 Stakeholder reflections and insights: perceived evidence gaps and awareness of impacts

**Some of the evidence gaps perceived by workshop participants could be addressed with a broader, more comprehensive evidence review (extending the scope for inclusion of studies to a global scale), whilst others will reflect genuine gaps in published knowledge. Overall, it was felt that published evidence on impacts is sparse and there is a bias towards birds (though some participants felt that this bias was proportional and justified, given the weighting of conservation focus on birds in the UK).**

### I) Assessing the impacts at scale

There were key questions and concerns from practitioners during Workshop 1 about the apparent lack of understanding of the cumulative effect and significance of disturbance on species, populations, and species assemblages at scale. Some of the evidence modelled the impact of disturbance on populations (e.g., for woodlark[22] and ringed plover[19]), and some presented findings from UK-wide surveillance (e.g., parasiticide presence in rivers[31], and the presence of Toxocara sp in urban parks[1]) but most of the evidence is targeted towards species in specific sites. There was uncertainty as to whether these impacts (particularly those with little contributing evidence) could be extrapolated to larger scales, and across different socio-ecological contexts.

### II) Wildlife disturbance

Participants felt that more evidence was required about the role of habituation as a response to disturbance. For example, what are the potential ecological effects of habituation, and is habituation variable across species, habitats and contexts? What role does behavioural/personality variation between individuals play in habituation, and does this have evolutionary consequences for populations adapting to coexistence with people and dogs? Furthermore, whilst habituation might develop towards disturbance by people and dogs, does this have consequences in terms of interactions with other species, and/or anthropogenic pressures and land uses (e.g., increased exposure to predation and novel pathogens)?

Participants also felt there was a lack of understanding as to how the impacts of disturbance might vary across seasons, contexts, or in response to emergent phenomena such as disease outbreaks. In terms of habitats, physical disturbance and eutrophication are reported for grasslands and urban parks, but not for trees, woodland, heath and moorland flora, and lichens, despite these being relevant for stakeholders[2].

Participants felt that synergistic effects between the different types of impact were likely. For example, there is potential for interactions between disturbance, physiological stress responses (potentially impacting body condition and immunity) and disease vulnerability/transmission.

[2] Except for one study which found that remnant forest was least impacted by deposition of dog faeces and urine compared to trees next to pathways and park grassland - 'impact' here being described as a change to soil chemistry.

### III) Disease transmission and parasiticides

Veterinary stakeholders highlighted the potential for novel, emergent zoonoses, in which dogs and dog walking could play a role. For example, the potential role of dogs (and other domestic animals) in the disease transmission cycle for avian influenza is currently unknown, despite the potential for disturbance and foraging/moving of diseased carcasses to play a role in the uptake and spread of disease.

The key question in relation to the evidence on parasiticides entering freshwater habitats was 'what is the quantifiable impact on biodiversity?'.

### IV) Socio-economic considerations

While our rapid review did not cover socio-economic impacts (both positive and negative) of dog walking, workshop participants highlighted this as a key area of consideration. The following evidence needs were highlighted:

- The implications of both positive and negative interactions between dog walkers and other users, e.g., recreationists, people from ethnic minorities, and neurodivergent people
- The impact of dog walking on recreational hunting and predator control
- The socio-economic factors that drive and/or underpin dog walking behaviours
- The relative impact of dog walking when compared to other recreational and land management activities
- The positive role of dog walking for conservation
- The impact of encountering wildlife for dogs and their guardians
- The impact on conservation of livestock worrying, both ecologically (e.g., how this effects conservation grazing) and socio-economically (e.g., the impact on farmers livelihoods, and on the wellbeing of farmers).

## 7.3 Awareness of impacts among dog walkers

During Workshop 2, participants from the canine and access sectors (which included representatives from dog charities, dog welfare organisations, dog trainers, and people working in conservation around access and recreation) drew on their experience to appraise, in their view, the levels of awareness of dog owners and professionals in the sector towards the impacts highlighted by the review. Participants were also asked to think about how complex they perceived the impacts to be, in terms of understanding and communicating them. Their assessment is presented in Figure 4.

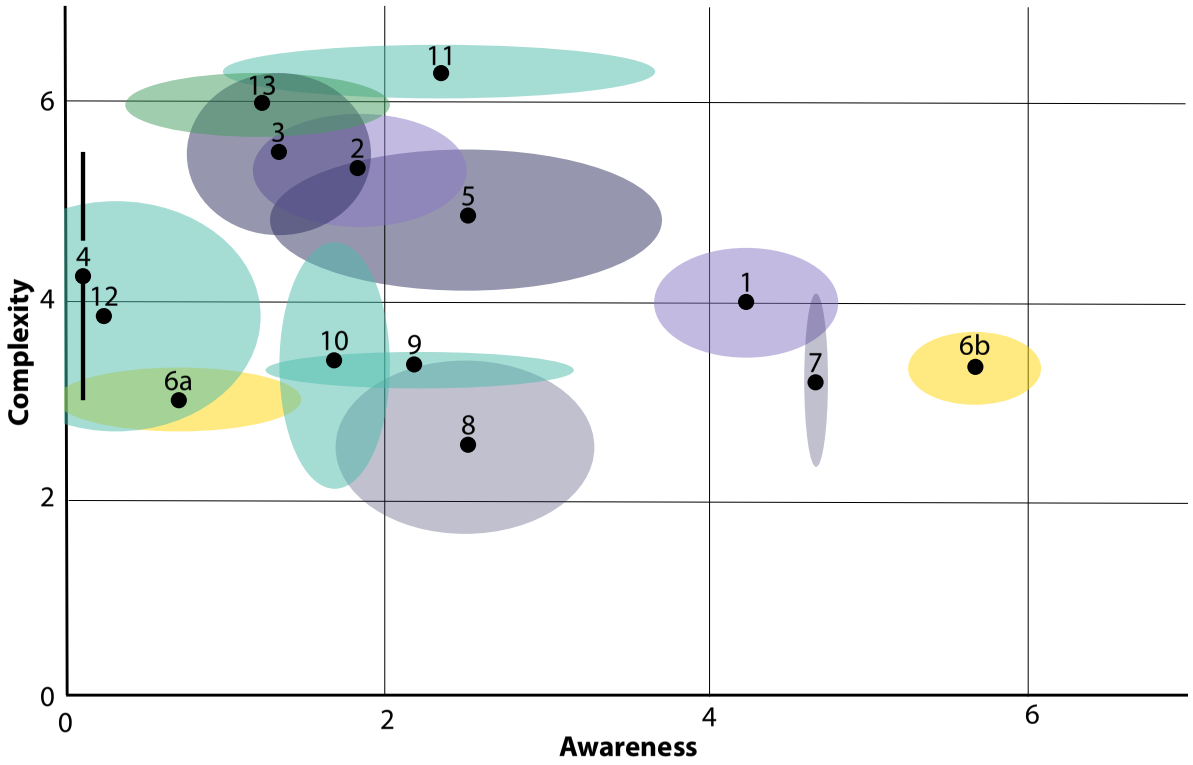
Participants felt that dog owners' awareness of environmental impacts was generally very low, with a moderate level of awareness towards the potential for disease transfer between dogs and people (via faeces), disturbance of ground nesting birds, and disturbance and displacement of wildlife (Fig 4). The complexity of the impacts was perceived as low to moderate. Perhaps surprisingly, adder predation was perceived to be the most complex issue to understand. This was due to some contestation of the evidence, with participants feeling that the model adder resembled a chew toy, which would attract attention and be treated as such by dogs, and that the risk of an encounter with a live adder was greater for dogs than the adder. The effects of coprophagia (wildlife eating dog faeces), impacts of disturbance on species richness, and the transfer of parasiticides into freshwater ecosystems were also thought to be relatively complex – reflecting uncertainty, for participants, of the effects of these impacts in the evidence.

Some of the impacts that are perceived to be most important for biodiversity conservation, and that have relatively strong support from the evidence, are perceived to be poorly recognised amongst the dog owning community e.g., the shedding of parasiticides into freshwater, impacts on species richness, and eutrophication.  It was perceived that dog owners are relatively aware of the risks of disease transmission between dogs and people, but much less so between dogs and wildlife – despite this being a relatively high priority for practitioners.

**What emerged overall was a collective feeling that the impacts were not necessarily hard for people to understand, but they were not being communicated effectively (if at all) to dog owners. A collective, cross-sectoral effort is required to engage dog owners in a relatable way, and in a manner which is not hectoring, punitive, or perceived to be discriminatory.**

**Figure 4** Perceived levels of awareness among dog owners of the impacts identified by the Paws for Thought rapid evidence review (the x-axis), plotted against the perceived level of complexity of the impacts (y-axis), by Workshop participants from the conservation, canine and access sectors. The solid dots highlight the mean response across participants; the bubble displays the variance around the mean for 'awareness' (how wide the bubble is) and 'complexity' (how tall the bubble is). For example, for impact 7 (disturbance by dogs reducing nest success for birds), there was little variance around the perception that dog owners are aware of the impact, but some variance around perceptions of how complex the impact is to understand and communicate.

**1** Wildlife being displaced from suitable habitat by the presence of dogs
**2** Dogs shedding parasiticides into water
**3** Dogs reducing species richness
**4** Eutrophication
**5** Dogs causing a physiological stress response in wild animals
**6a** Disease transmission from dogs to wildlife
**6b** Disease transmission from dogs to humans
**7** Disturbance by dog reducing nest success for birds
**8** Dogs physically distubring terrestrial flora
**9** Dogs physically disturbing ponds and aquatic flora and fauna
**10** Disturbance of wildlife from dogs barking
**11** Dogs predating adders
**12** Dogs being a vector for invasive species
**13** Wild animals eating dog faeces



## 7.4 How to use the evidence

### Conservation Practitioners

- Interrogate the evidence and build on this foundation, broadening and consolidating the evidence to improve decision making.
- Use this evidence to inform and plan interventions, directing resources in response to local priorities but being mindful of the potential interactions between the different impacts, and across scales.
- Use this evidence in advocacy, messaging, and collaborations with stakeholders, e.g., local dog walking communities.
- Think holistically and seek equity; consider the potential interactions between different types of impacts, alongside access considerations for people, their dogs, and other users (e.g., One Health, section 5.2).
- Collaborate with researchers, or contribute to research, to better understand these impacts and to fill in the knowledge gaps.

### The Canine Sector

- Use this evidence to raise awareness with collaborators, members, and associated communities.
- Streamline the various guides for promoting responsible dog walking. Incorporate evidence into guidance, and into training material for commercial dog walkers and other professionals in the canine sector.
- Collaborate with the conservation sector to reach and engage dog owners around responsible behaviour in areas prioritised for wildlife.
- Collaborate and contribute to research, to increase our collective understanding of the impacts and the interactions between people, dogs, wildlife and the environment.

### Researchers

- Build on this foundation of evidence.
- Respond to the perceived knowledge gaps highlighted by practitioners, whether this entails highlighting existing research or exploring opportunities for novel research.
- Draw on interdisciplinary expertise and cross sectoral collaboration to improve the breadth and quality of evidence, particularly for socio-economic and cultural aspects of the relationships between people, dogs, wildlife and the environment.

# Regulation & Licensing

# 8. Regulation & Licensing

**We have produced a synthesis of the perceived opportunities and challenges of regulation and licensing that emerged from the three workshops (Table 3). Whilst licensing and regulation were contentious topics in the first two workshops, there was some support in Workshop 3 for some form of regulation, whether that be a softer option of registration schemes, e.g., by Local Authorities, or a harder approach of passing legislation to implement licensing.**

Participants perceived that regulation would create avenues for supporting the mitigation of impacts on wildlife and the environment, but also enable a raising of standards across the board, helping to regulate, for example, imports of dogs and unethical/exploitative breeding practices. Indeed, animal welfare and societal considerations are the main policy drivers currently, though there are clear opportunities to incorporate environmental and conservation prerogatives into policy decisions.

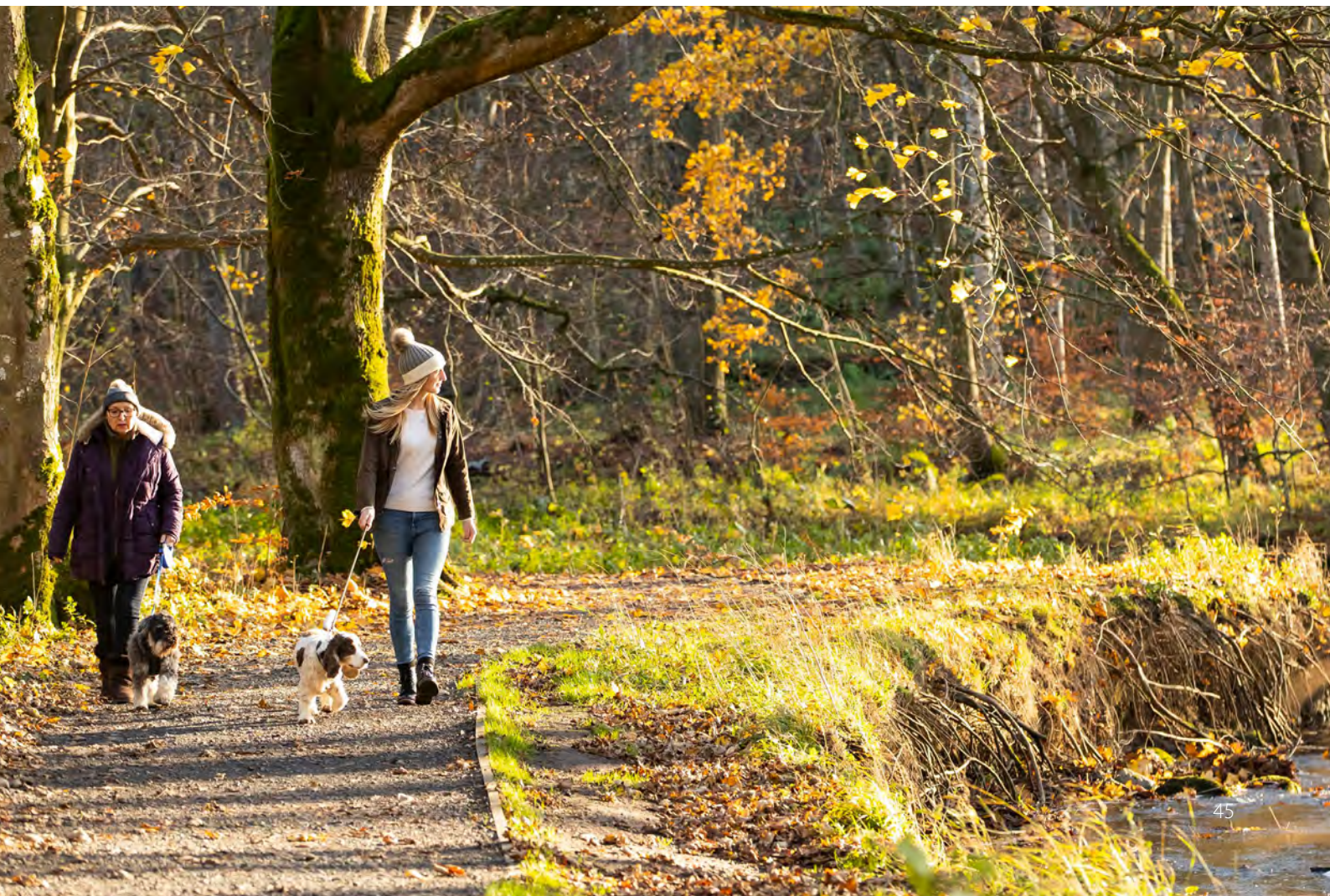
| Dog owners | |
|---|---|
| **Opportunities** | **Challenges** |
| • Creates a channel for information provision, supporting people with breed specific information; guidance and requirements for responsible ownership; safety & welfare; and environmental considerations (e.g., types of sensitive site, guidance on minimising disturbance etc)<br>• A certification process could be free and online. This could involve assessment-based accreditation which requires applicants to demonstrate their understanding of the regulator's requirements and expectations<br>• Certification or registration could be linked directly to, for example, the Countryside Code, raising awareness more broadly. | • There would need to be an effort to build confidence, trust and support for licensing or registration amongst dog owners<br>• Licensing could be economically exclusive<br>• Assessment of the potential for licensing and registration must consider the wider societal impacts on, and consequences for, people who might be excluded from having dogs |

**Table 3** The perceived opportunities, and challenges, of licensing and regulation (for dog owners, commercial dog walkers, trainers and educators, and legislators and administrators) from stakeholders involved in the Paws for Thought process.

| Commercial dog walkers | |
|---|---|
| **Opportunities** | **Challenges** |
| • Commercial dog walkers are themselves supportive of a licensing or registration scheme. There is appetite for a definitive body to establish a code of conduct and standards.<br>• Standards could be raised. There are numer-ous groups purporting to represent commercial canine interests who have variable standards and qualities of service<br>• Licensing creates a direct route for provision of training/education material and information<br>• Could set restrictions on the number of dogs that can be walked at any one time. | • Licensing commercial dog walkers is premises based. Most dog walkers do not have a business premises, so there is nowhere for Local Authority staff to check regarding adherence to license requirements<br>• Registration schemes, like those implemented currently by some Local Authorities, would be a more proportionate response<br>• Registration is less onerous and cheaper, and could be an intermediary step before licensing |

| Trainers and educators | |
|---|---|
| **Opportunities** | **Challenges** |
| • Potential for mandatory integration of wildlife and environmental considerations into training materials and certification processes<br>• Get to the source of the problem; the roots of training and advocacy for dog owners | • No lack of appetite, but need a respected and capable body to make decisions and arbitrate frictions between individuals/organisations adopting different approaches within the sector |

| Regulators and administrators | |
|---|---|
| **Opportunities** | **Challenges** |
| • Could be self-funding; allowing subsidy for people who are economically vulnerable, and funding enforcement/administration costs<br>• Example: a £10 levy for the 12 million dog owners in the UK could generate £1.2 billion, which would cover administration and enforcement<br>• Would help to get a handle on numbers of dogs in the UK; to clamp down on exploitative breeding; and to regulate imports of dogs | • Potential for kick-back from the public – protest<br>• Navigating vested interests (e.g., insurers and pharmaceuticals)<br>• Licensing could be costly<br>• Government would need to ring fence funding for a licensing body<br>• Currently, there are not enough resources to enforce<br>• A license administered by a Local Authority would be restricted to the district in which it applies – it would be challenging to apply across different jurisdictions and landscapes<br>• Licensing commercial dog walkers is premises based. Most dog walkers do not have a business premises, so there is nowhere for LA staff to check against a license requirement.<br>• Creation of a licensing body would require multiple government agencies and political backing to drive development |



# Adopting a Holistic Approach

## Advancing an adapted One Health Framework

# 9. Adopting a Holistic Approach: Advancing an adapted One Health Framework

## 9.1 Rationale for a One Health approach

**A clear message from the mission process was the need to adopt an evidence-based approach to managing the impacts of dog walking on wildlife and the environment, but to balance this against the benefits of dog ownership for people's health and wellbeing. An emergent trend from the stakeholder engagement process in the lead up to the workshops was that a biodiversity conservation message on its own has mixed success in affecting dog walker behaviour. Doherty et al. (2017) suggest that greater uptake by communities may be achieved by integrating human health and animal welfare objectives into dog management, rather than focusing solely on conservation. With this in mind, and having appraised the evidence of impacts with participants in the workshops, we undertook activities in both workshops to explore the needs of people and their dogs, other users, wildlife and habitats, and where there were intersects and trade-offs between these needs. This was framed around a central objective of promoting community resilience, health equity, and welfare, where the concept of community was explicitly extended beyond human/dog communities to include wildlife and the natural environment.**

In Workshop 1, with practitioners, we trialled a One Health (OH) framework adapted from Stephen *et al.*, (2023; Fig 5). Stephen et al., describe the goal of a OH framework for conservation as being "to combine knowledge, policies and resources to make a setting healthier for all that live there, rather than addressing risks to only one group in a space shared with others. In the context of conservation, this requires OH to use a holistic ecosystem approach which considers the wildlife, the environment, the people, and the historical and current setting". We advanced and experimented with this framework based on the following rationales:

- OH can combine social and ecological considerations around a central premise of health equity and resilience, potentially enabling managers to communicate conservation priorities in a way that has more resonance with dog walkers and other members of the public.
- Effective collaborations for health and resilience are more likely when participants have a clearly stated purpose based on shared values and interests – a OH framing might be a vehicle for achieving this shared sense of purpose across stakeholders.
- Understanding and managing health from an interspecies point of view calls for the awareness of similarities and differences between the need of different living things in the same setting.
- One of the goals of an adapted OH framework is to improve coherence and collaboration in addressing health and resilience challenges across human/dog and wildlife communities, and the wider environment.
- It can seek to find ways to better target and mobilize resources to address socio-ecological challenges.
- The framework can provide a common vision for research and practitioner action that seeks cross-sectoral benefits, united by the objective of facilitating sustainable coexistence between people, dogs and the environment.
- The central premise of the framework is ensuring health equity for species, and for current and future generations. Equity between people, their dogs, and non-human species becomes the guiding objective.

## 9.2 Applying the One Health framework with practitioners

During Workshop 1 we introduced the framework and facilitated participants working through a set of guiding questions (Appendix II, table 5) in relation to three hypothetical scenarios representing different scales and considerations: 1) a 50 hectare Nature Reserve, 2) a 1200 hectare Country Park, and 3) a 50,000 hectare National Park. Each scenario had specific characteristics and considerations to aid and orientate discussions (Appendix II, fig 6).

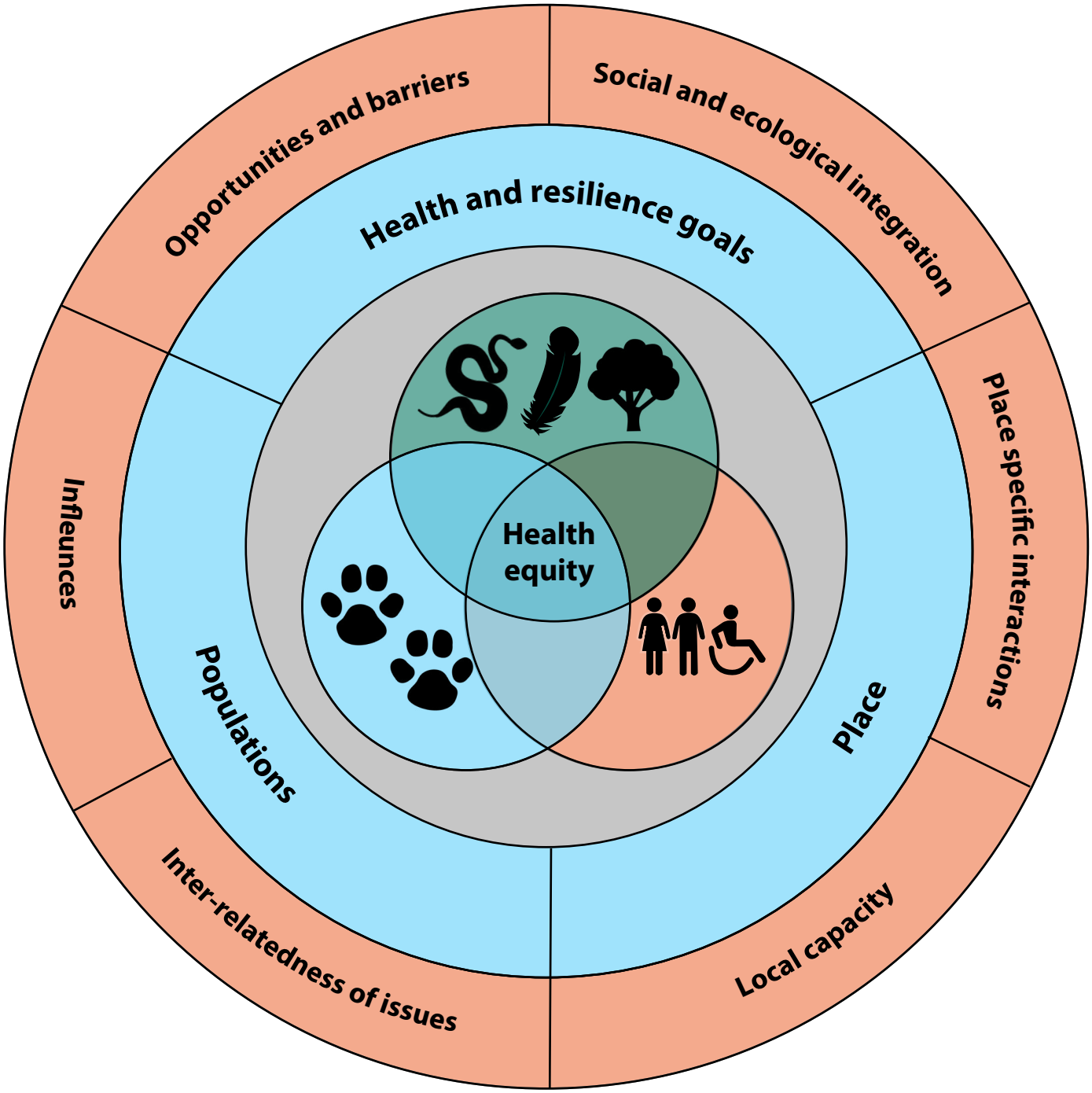



**Figure 5** A One Health framework, adapted from Stephen *et al* (2023), to aid the holistic appraisal of coexistence between people, dogs, wildlife and habitats, and to identify and target effective interventions to mitigate impacts and promote coexistence. The central premise of the framework is to ensure health equity across shared communities of people, dogs, and non-human entities, over generations

## What worked: Opportunities

- Participants felt that the framework worked well for the first two scenarios: the 50-hectare nature reserve and 1500-hectare country park.
- Pivoting around a central objective of achieving health equity encouraged a broader consideration of different populations needs.
- Participants liked the extension of community to include non-human elements and felt this was a compelling and persuasive framing for biodiversity conservation.
- The framework encouraged consideration of how multiple impacts could interact, facilitating identification of systemic and thematic issues that underly symptomatic problems.
- The framework provoked consideration of, and a recognition of the need for, an interdisciplinary approach to problem diagnosis and planning of interventions; encouraging integration of different kinds of evidence and knowledge.
- An integrated appraisal of the situation helped identify knowledge gaps and evidence needs.
- Opportunities for collaborations and co-benefits within and across communities were identified.
- The framework helped identify connections and overlapping priorities between different stakeholders. E.g., where funding, resources and expertise could be pooled, shared, or better co-ordinated.
- Opportunities for synergy and integration with One Health strategies targeted towards zoonoses (diseases and infections that can pass between wildlife and humans, pets, and livestock) were highlighted by participants.

## What was challenging: Potential barriers

- Participants found themselves getting bogged down with trying to handle the complexity of multiple interacting and overlapping considerations.
- In relation to the above point, it was necessary for the facilitators to continually define and clarify the objective as orientating around people, their dogs, and wildlife and the environment – not to exclude wider factors if they were relevant but to focus, at least in the initial stage of enquiry, on the core objective.
- Participants found the framework challenging to apply to the largest scale scenario – the 50,000 National Park – due to the complexity inherent in working at a landscape scale (e.g., the number of stakeholders, relevant populations, and multiple human communities, relationships and interactions).

## 9.3 Summary of the One Heath framework

**In combination the OH framework enables a 'systems map' to be developed which captures and balances the desired outcomes for the health and wellbeing of people and dogs alongside biodiversity conservation objectives. The delivery of these outcomes then needs to be planned in a spatially explicit manner to identify clear areas that require different approaches for management to be delivered. This should lead to more equitable outcomes and support action and communications, which has greater penetration and receptivity within the dog owning community.**

Application of the framework could be approached in two ways following assessment of the evidence and the landscape context: 1) with a focal site already in mind, or 2) following identification of geographic areas or habitats with high levels of exposure or sensitivity to dog walking, and then identifying a particular site or collection of sites to focus on.

The framework has the advantage in that it is primarily site or place-focussed but can be scaled up. For example, an OH plan can be derived for a single site (e.g., a local nature reserve) but nest within an OH plan at the landscape or regional level, encompassing multiple sites. In this way, collaboration across land holdings under different ownership is encouraged and facilitated, creating more joined-up and coherent solutions. An OH approach also has the advantage of and potential to intersect with existing UK government OH focusses, e.g., for vector-borne diseases and sustainable food systems (UK Government's One Food programme). Vet Sustain advocate a One Health approach for managing the use of parasiticides in the pet health sector.

Overall, the participants found the OH paradigm useful but noted that to be most effective it requires adequate time for exploration, and ideally facilitation support. We strongly recommend the involvement of interdisciplinary expertise in this type of appraisal, to effectively identify and integrate social and ecological factors. We provide more detailed guidance on how to progress through and apply the One Health framework in our supporting guidance, 'Adopting a standardised, holistic approach towards managing the impacts of dog walking on the environment'.

# The Need for a National Conversation

# 10. The Need for a National Conversation

**Based on our evidence review and our mapping of the exposure of protected areas to dogs (see our guidance for 'Adopting a standardised, holistic approach towards managing the impacts of dog walking on the environment in the UK'), negative impacts on the environment are likely from dog walking activity, and the scale of dog ownership means that they are widespread throughout the UK.**

A theme that emerged throughout the engagement phases of the process was a perceived change in dog ownership culture in the UK, over the last decade. Stakeholders perceive that dogs have taken on an elevated role in some people's lives, transcending pet status. For many people dogs now have equivalency with other humans, in terms of how they are treated, and the rights and the entitlements ascribed to them by their guardians (e.g., Greenbaum 2004). While this is positive, in terms of recognising the value and importance of dogs in our lives, it creates sensitivities around advocacy for responsible ownership, as guidance around responsible dog walking behaviour can be perceived as a restrictive infringement of the rights and needs of dogs. The proliferation of dog related social media content is perceived by some stakeholders within the canine sector as undermining responsible behaviour, by sharing and promoting practices not endorsed by current codes of responsible pet ownership.

Stakeholders and workshop participants perceived that a culture change within society (including dog walkers) was necessary to foster a realisation and appreciation that people are nested within broader socio-ecological communities and have responsibilities. They call for a national conversation to bring the evidence of the impacts of dog walking on the environment to the fore, and address what is perceived to be a foundational issue associated with the prioritisation of one's needs, and the needs of one's dog, over the needs of other people and of the natural environment. There are systemic issues which exacerbate the problem; arguably, limited access underpins the overall issue, as people and protected areas/designated habitats are pinched together in a landscape dominated by private ownership (particularly in England, Wales and Northern Ireland – Scotland has a much greater degree of open access, provided people behave responsibly). But as indicated by workshop 2 participant's perceptions of low awareness amongst dog owners of the impacts of dog walking on biodiversity, **avenues must be sought to engage and involve dog owners in the conversation about the impacts of dog walking on biodiversity – reinforcing the perceived need amongst stakeholders for a national conversation.**

# Integrating Outcomes: Recommendations

# 11. Integrating the Outcomes: Recommendations

**Based on the findings and outcomes of the Paws for Thought process we make the following recommendations:**

## 1 Adopt a holistic approach towards identifying effective, equitable solutions

**There is a diversity of stakeholder interests concerned with the interactions between people, dogs, wildlife and the environment across varying scales and contexts. These all interact with external social, ecological, economic and political factors. Achieving effective, equitable solutions within this complex space requires a holistic approach. As such, all the following recommendations are nested within the need for a holistic, systems approach towards coexistence.**

- We found that the One Health framework enabled participants with different objectives to coalesce around a central objective of achieving health equity for populations in a given setting.
- A One Health approach obliges practitioners and land managers to balance the needs of wildlife and habitats with the health and wellbeing benefits of dog ownership for people (and the economic needs of people working in the canine sector).
- With facilitation support, a framework such as this has the potential to map out multiple interacting factors and priorities in a structured, manageable way.
- A One Health approach has the advantage of being able to intersect with other One Health based interventions around the management of disease, zoonoses, and public health.

## 2 Adopt an evidence-based approach to managing interactions

**We advocate adopting an evidence-based approach to managing the interactions between people, dogs, wildlife and habitats.**

- Use evidence to prioritise focus, effort, resources, and to optimise intervention strategies - matching intervention to impact.
- Challenge assumptions and, where feasible, undertake research and gather data to substantiate reported impacts and to test interventions, thereby bolstering the knowledge base.
- We found the Balanced Evidence Appraisal Method to be appropriate for appraising the weight of evidence relating to an assumption. BEAM can accommodate different types of evidence, (e.g., data derived from experimental designs, opportunistic monitoring, and field reports/observations), and weights pieces of evidence based on their quality and reliability.

## 3 Build on the evidence and address the gaps

**Workshop participants highlighted knowledge gaps and expressed a need for incorporation of the socio-economic and cultural dynamics of dog ownership into the evidence base for biodiversity conservation.**

- Use the evidence from our evidence review as a foundation on which to build; interrogate and consolidate the evidence and add to the evidence base.
- Respond to the perceived knowledge gaps. A full systematic review which includes socio-economic and cultural factors will likely satisfy some of the perceived gaps and needs.
- Encourage, facilitate, and contribute to new research to address the genuine knowledge gaps.

## 4 Communicate known impacts effectively

**Participants perceived that awareness of wildlife and environmental impacts amongst dog owners and the canine sector was generally low, but that dog owners are receptive to messaging, and the issues are not too complex to understand if communicated effectively. Dog owners generally want to avoid negatively impacting wildlife and the environment; it is important not to blame or villainise when talking about impacts.**

- Use the evidence to inform dialogue with stakeholders across different sectors and dog owners, raising levels of awareness (e.g., our 'Good Walk for All' infographic).
- Collaborate across sectors to maximise the reach and penetration of stakeholder engagement, and to improve the consistency, clarity, and coherence of messaging.
- Audiences are diverse in their demographics, backgrounds, experiences, and values. Collaboration across sectors and with diverse stakeholder organisations facilitates improved reach and receptivity of messaging.
- Consider working with social media, and respected influencers who have access to large followings and harder to reach groups.
- A health and wellbeing message has more traction than solely conservation-based message. Frame conversations around community health, welfare and resilience, where non-human constituents are part of our shared community (e.g., a One Health framing).

## 5 Adopt and promote a consistent, coherent approach towards interventions

**Variability in the approaches and quality of interventions that seek to manage interactions between people, their dogs, other users, wildlife and the environment leads to confusion for dog walkers, undermining the efficacy of interventions. A common and standardised national approach, based around zoning, is desirable and has widespread support.**

- Adopt a standardised approach towards planning and implementing interventions through a zoning approach, as advocated in our guidance 'A standardised approach towards managing coexistence between people, dogs, wildlife and the environment'.
- Communicate clearly with dog walkers so that wherever they are, they are familiar with behavioural expectations associated with red, amber, and green zones.
- Adopt best practise principles around recommended interventions. There are a range of available measures to support zoning which are being successfully applied by the leading innovators in this field. Interventions need to be deployed in concert, and sensitively, with community engagement and support, to have the most impact and buy in.

## 6 Align the codes

**Numerous versions of 'canine codes' exist, which is confusing for dog owners. A simple, definitive code is required, to create consistency and clarity. For dog walking specifically, we have integrated the key principles of several codes to develop our evidence-based infographic, 'A good walk for all'.**

## 7 Collaborate across sectors and disciplines

**Managing dog walking impacts involves multiple interested sectors and academic disciplines. The value of cross-sectoral collaboration and interdisciplinary research and expertise was unanimously endorsed by workshop participants.**

- Use existing networks to promote the sharing of evidence, experience and expertise – collectively raising the bar of best practise.
- Integrate the different fields of research that intersect around dogs and the environment, enabling more equitable and effective management strategies.
- The conservation, academic and canine/pet sectors should work together to optimise research focus, improve the equitability of interventions, co-design communication strategies, and engage in and advance the discussion around regulation and licensing.
- Stakeholders and workshop participants perceived that a culture change within society (including dog walkers) was necessary to foster a realisation and appreciation that people are nested within broader socio-ecological communities. Interdisciplinary and cross-sectoral collaborations are necessary to conceptualise and communicate this vision to different audiences.
- Stakeholders from the conservation, access, and canine sectors should contribute and have their voices heard with regards the debate around regulation and licensing. The best forum for this is the All-Party Parliamentary Dog Advisory Welfare Group.

## 8 Open a national conversation around sustainable coexistence between people, dogs, and the environment

**Our evidence review found that there are likely to be some adverse environmental effects from dog walking activities, and the current scale of dog ownership means that these impacts are likely to be widespread throughout the UK. Stakeholders felt that a national conversation was required to bring these issues to the fore.**

- The previous recommendations support the perceived need of stakeholders to address the environmental issues associated with dog walking at a national scale.
- This conversation will need to be sensitive and balanced; our evidence review, One Health framing, and recommendations around cross-sectoral collaboration, increased interdisciplinarity, and communications, could support the initiation and framing of this conversation.

# Closing Remarks

# 12. Closing Remarks

**This mission has sought to 'take a pause' to collate evidence and appraise the impacts of dog walking on biodiversity in the UK. In collaboration with stakeholders, we identify and highlight the gaps in our knowledge and understanding and bring together learnings from best practice across the conservation, access and canine sectors towards managing coexistence issues.**

We recognise the limitations of our mission timescale which precluded a full systematic review and restricted the evidence review to the impacts on biodiversity. We hope, however, that our outputs provide a foundation and useful point of reflection – a stock take - upon which to build, especially with regards to incorporating socio-cultural and economic factors into the evidence base.

We emphasise that whilst we have highlighted impacts that will predominantly be interpreted as being negative, we do not wish to vilify dogs and their guardians. Dogs are our companions, with whom many of us would not wish to be without. They bring us joy, companionship, and buoyancy in a challenging world – and in most cases we wish to provide them, in return, with a rich and fulfilling life. The great majority of dog owners do not wish to cause harm when walking their dogs. Our Good Walk for All highlights how awareness and relatively simple practices can ensure people enjoy a rewarding walk that meets their needs and the needs of their dogs, whilst being responsible and mindful of the needs of others.

The standardisation of approaches towards managing coexistence issues, that we advocate, aims to provide a level of consistency in how we appraise and manage interactions between dog walkers, other users, wildlife and habitats. It is a process that can be adapted, though we recommend, in response to stakeholder need, adoption of the traffic light zoning system (with pawprint icons) throughout the UK – so that no matter where a dog walker finds themselves, they know what is expected of them. This will reduce confusion for dog walkers and help to integrate management plans across organisations and land holdings, from the site to the landscape (e.g., a management plan for a local nature reserve is nested within landscape scale planning, such as local nature recovery strategies).

It is likely that interventions and restrictions have often met resistance because they can be perceived to impinge on what for many is seen as a basic freedom – to access greenspace with one's dog, without restriction – given than so much of people's (and dogs) lives are restricted. Rather than more restrictions or tougher enforcement, therefore, numerous stakeholders engaged in this mission felt that a culture change is required; to engender a sense of collective responsibility, endeavour, and compassion towards protecting biodiversity. This is, in essence, the emphasis of our call for a One Health approach and framing; the raising of awareness, and an extension of one's sense of responsibility to include the health, wellbeing and resilience goals of a wider a socio-ecological community.

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# Appendices

# 15. Appendices

## Appendix I: Workshop design and delivery

Three participatory workshops were held from June to August (2024); two in person in Birmingham, and one online. We utilised tools from participatory research methods to structure the Workshops which were facilitated by the ExCASES team. The in-person workshops were designed with consideration of the results of the evidence review and in response to the needs and aspirations communicated by stakeholders during the scoping and engagement phase. The third, online workshop, was specifically focussed on regulation and licensing considerations. Workshop participants are listed in Table 3. Some participants attended more than one workshop.

Data from the workshops was recorded by facilitators in written form on flipchart paper; by audio recordings of plenary discussions; and through specific activity data sheets. Photographs of all the materials were taken at the end of the workshop. The data was transcribed and analysed using inductive thematic analysis to identify emergent themes.

**Table 4: Stakeholder representation/contribution to the Workshops (W)**

| Participating organisation/institution/individual | W1 | W2 | W3 |
|---|---|---|---|
| All-Party Parliamentary Dog Advisory Welfare Group | | | 2 |
| Bird Aware Solent | 1 | 1 | |
| British College for Canine Studies | | 1 | 1 |
| Cheshire Wildlife Trust | | 1 | |
| Dorset Dogs | 1 | 1 | |
| Driving with Dogs | | 1 | |
| Feline & Canine Sector Working Group | | 1 | 1 |
| Love Your Paws | | 1 | |
| National Trust | 1 | 1 | 1 |
| Natural England | 1 | 2 | 1 |
| Natural Resources Wales | 1 | | 1 |
| NatureScot | 1 | | |
| New Forest National Park Authority | | 1 | |
| Registration Council for Dog Training Instructors | | | 1 |
| RENEW | | 1 | |
| Right to Roam | 1 | | 1 |
| Royal Society for the Prevention of Cruelty to Animals | 2 | 2 | |
| Royal Society for the Protection of Birds | 1 | | |
| Woodland Trust | 1 | 1 | 1 |
| Youth 4 Nature | | 1 | |
| Zoological Society London | 1 | | |
| **Workshop total** | **12** | **16** | **10** |

## Appendix II: One Health Framework

Table 5: Guiding questions for working through the different focusses of the adapted One Health approach used with participants in Workshop 1 of the Paws for Thought process; undertaking a holistic exploration and assessment of the health equity needs of different populations within a given setting.

| One Health focus | | Guiding questions |
|---|---|---|
| Populations | Inter-relatedness of issues | What are the health and resilience issues for the populations in the setting, and how do they relate to each other? |
| | Influencers | Which are the key populations that influence the health and resilience issue/s in the setting? |
| Health & resilience goals | Social & ecological integration | What are the social and ecological goals for the populations in this setting? |
| | Barriers & opportunities | Where do the enablers and impediments for meeting these goals overlap between people, dogs, wildlife and habitats? |
| Places | Place specific considerations | What are the intersecting determinants of human, dog, and environmental health that are unique to this place? |
| | Local capacity | What is the local capacity for collective actions leading to improvements in community (human and non-human) health and resilience in this setting? |

**Scenario 1:**
*a nature reserve*

- 50 hectares
- Mix of inter-tidal mud flats, sand and shingle beach, and salt marsh.
- SSSI for little terns (breeding) and harbour seals (haul out)
- Overwintering waders and waterfowl
- Predominantly visited by local people
- Popular with professional dog walkers and bird waters
- Most people drive to the reserve - quite isolated
- No permanent reserve staff

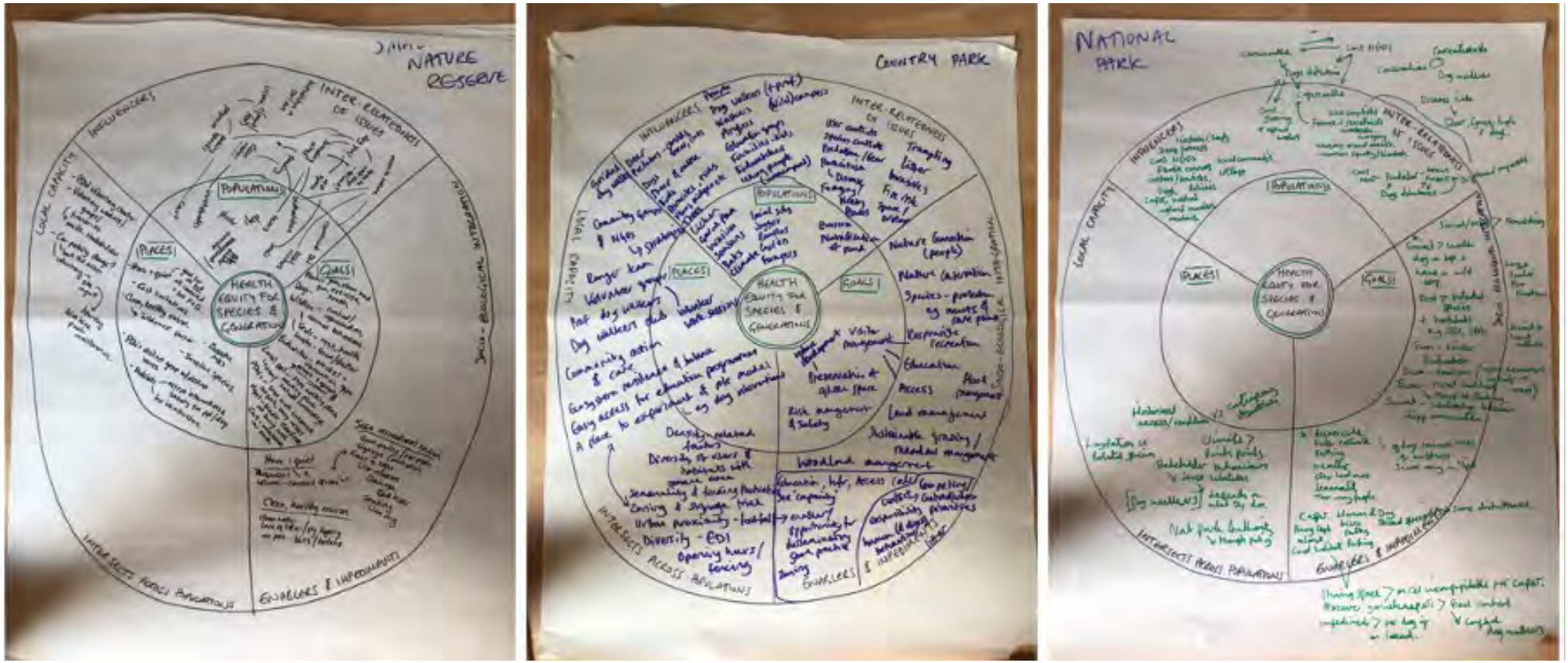
**Scenario 2:**
*a country park*

- 1200 hectares
- Mix of broadleaf woodland, managed grassland, freshwater ponds, and parkland
- Resident herd of fallow deer
- Great crested newts and a number of rare pond plants and dragonflies
- Cattle and sheep used to graze the grassland
- Popular for picnics
- High number of visitors
- On the outskirts of a city
- Local dog walkers club
- Small ranger team

**Scenario 3:**
*a national park*

- 50,000 hectares
- Upland, mountain and river valley
- Numerous conservation NGOs, NP authority, and private estates (mainly field sports focussed)
- Prominent species - capercaillie and wildcat in woodland, and breeding waders in the uplands (e.g., curlew and golden plover)
- Extensive sheep farming
- A popular destination for tourists and retirees seeking a wilder life
- Tense relations between the NPA and local communities

**Figure 6** Three hypothetical scenarios used with participants in Workshops 1 and 2 of the Paws for Thought process, to explore the needs of different users, and where these needs intersect. In workshop 1 these scenarios were used to trial an adapted One Health approach towards supporting coexistence between people, dogs, wildlife and habitats. In Workshop 2, they were used in a less structured way to encourage a more general reflection on the needs of different users. In both cases, participants were asked to think about, and prioritise, health equity.




**Nature Reserve** **Country Park** **National Park**

**Figure 6** An example of the outputs from a 40-minute facilitated activity that trialled an adapted One Health approach with Workshop 1 participants during the Paws for Thought Process, for three hypothetical scenarios.

RENEW

**Renewing biodiversity through a people-in-nature approach**

ExCASES Mission

# Paws for Thought

## Towards environmentally friendly dog walking in the UK

ExCASES is a 'solutions generator' designed to tackle issues facing biodiversity renewal that are not covered by RENEW's four core themes. It provides an agile, flexible mechanism to work collaboratively with partners, researchers, and organisations from diverse sectors on focused topics. This cross-cutting theme is run by an interdisciplinary team of researchers based at the National Trust and the University of Exeter.

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