Perspective paper:

Conceptualising coexistence with large carnivores in Europe

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Large Carnivore Initiative for Europe

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Perspective paper:

Conceptualising coexistence with large carnivores in Europe

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Foreword

The European Commission issued a a call for tenders (ENV/2023/OP/0019) “Support for Coexistence with Large Carnivores” in 2023. The resulting contract N° 09.0201/2023/907799/SER/ENV.D.3 was awarded to a consortia of Istituto di Ecologia Applicata, Adelphi Consult and Callisto. This report has been developed by the members of the IUCN/SSC Large Carnivore Initiative for Europe (chair: Luigi Boitani) as well as other experts with the support of Istituto di Ecologia Applicata in partial support of this contract. Additional funding for multiple authors has come from a Horizon Europe funded research project (CoCo: Grant Agreement 101181958) and a Biodiversa funded project (Transwild: funded under the 2021-2022 BiodivProject joint call, co-funded by the European Commission: Grant Agreement 101052342).

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Abstract.

Coexistence is emerging as a very common concept with respect to wildlife conservation in human-dominated landscapes. However, the term remains poorly defined, leading to some controversy about its implementation. Based on decades of accumulated experience across the continent of Europe the objective of this perspective paper is to present a proposal for how coexistence should be viewed with respect to large carnivore conservation. The article summarises the positive values that motivates large carnivore conservation as well as the diversity of conflicts which their presence can create. It then explores the ecological and legal / policy frames within which conservation is constrained. The article proposes that coexistence has to consider three dimensions, the ecological (concerning the ability of large carnivores to tolerate human-dominated landscapes), the social (concerning the ability of human societies to adapt to and tolerate large carnivore presence), and governance (concerning the ability of different stakeholder groups and segments of the public to negotiate their different values, interests and concerns about large carnivore management). Coexistence can only be achieved when all three dimensions are effectively addressed. As a result, it is proposed that coexistence is as much a question of process as of a given end state, with a clear need for compromises and a recognition that it may adopt rather different approaches in different areas. However, it is also underlined that this scope for diversity must be constrained by the legal and policy frames as well as the ecological needs of large carnivores for massive areas of interconnected space. Finally, a set of principles for coexistence are identified.

1. Introduction

The term "coexistence" is often used in relation to large carnivore conservation in Europe, but what does it actually mean? This discussion has emerged against the backdrop of the recovery of these species in recent decades (Chapron et al. 2014, Di Bernardi et al. 2025, Kaczensky et al. 2024). However, like many aspects associated with large carnivores, the word “coexistence” itself has been drawn into the diverse social, cultural and political conflicts related to this endeavour. This is in part because the concept of coexistence doesn’t have a formal definition within conservation science (despite much conceptual work on the idea), and accordingly is used in many different contexts with different meanings attached to it, which have also changed over time.

Since 1995, the Large Carnivore Initiative for Europe (the LCIE – a specialist group within the IUCN's Species Survival Commission) has sought to bring interdisciplinary science to bear on facilitating large carnivore conservation. At its inception the LCIE adopted a mission statement “*To maintain and restore, in coexistence with people, viable populations of large carnivores as an integral part of ecosystems and landscapes across Europe*”. This mission statement was expanded into longer manifestos, with a first version in 2013, subsequently updated in 2023 (www.lcie.org).

The perspectives presented in this article are drawn from the authors’ experiences from the 28 countries in which they live and from their collective experience working internationally and with pan-European institutions across the 24 continental countries of the EU and the more than 35 Council of Europe countries that contain large carnivores. Many of the authors have been professionally engaged with large carnivore issues since the 1970’s. In the five decades in which our personal experience covers there have been many changes to the social, economic and political structure of Europe, most noticeably the transition from a Soviet dominated eastern block in a divided Europe, to the rise of pan-European institutions like the EU and the Council of Europe. A very diverse range of experience with manging large carnivores and their interactions with humans has accumulated across this period and across the diversity of geographic and political contexts. Large carnivores have been, and still are, managed in many different ways across Europe. For example, with some species in certain locations and periods managed as game animals, and others strictly protected. Some populations number in the thousands of individuals, while others number in the tens of individuals. Some populations are contained within a single country, while others span up to 8 countries. Human land uses vary dramatically, as do the ecological conditions. Conservation actions vary from active reintroductions to facilitating natural recovery. Some countries have had a continuity of large carnivore presence, whereas others have experienced recent recolonisation after centuries of absence (Kaczensky et al. 2024, Linnell et al. 2008, Linnell & Boitani 2025). From this diversity have come many

examples of best-practices, as well as many examples of suboptimal and even dysfunctional approaches (Appendix 1 lists many technical reports that chart the accumulation of this experience).

Accordingly, the objective of this perspective paper is to try to clarify this accumulated understanding of large carnivore conservation issues with respect to the meaning of the term “coexistence”. Although our focus is on large carnivores in Europe, there is a clear transfer value of our results to other species and continents where wildlife is persisting, or recovering, in human-dominated landscapes, and where the nature of coexistence remains a contested topic.

2. Ecological constraints

In all conservation endeavours there is a set of ecological constraints set by biological properties of organisms and ecosystems that cannot be compromised. In other words, conservation strategies have to be developed within the constraints of species’ tolerances. The large carnivore species that the LCIE mainly focuses on in Europe (wolf *Canis lupus*, brown bear *Ursus arctos*, Eurasian lynx *Lynx lynx*, and golden jackal *Canis aureus*) are all species with historically wide distributions and broad habitat tolerances (Cretois et al. 2021). Although its range in Europe is limited to Fennoscandia, even the wolverine *Gulo gulo* is a circumpolar species within the boreal / arctic regions. Yet, there are some clear constraints that represent premises for their conservation. Most of these stem from their predatory lifestyles, which imply that they (1) kill other animals to live, (2) have large spatial requirements, occupying home ranges measured in the tens, hundreds or even thousands of square kilometres, (3) often exhibit long distance dispersal over distances of hundreds or thousands of kilometres, and (4) accordingly occur at relatively low densities compared to other mammals. The consequence is that populations of these species require vast areas of suitable habitats that far exceed those of any protected areas in Europe (Boitani & Ciucci 2009, Boitani & Linnell 2015).

This situation is further influenced by the development of conservation goals beyond the minimum thresholds needed to avoid extinction to the longer-term objectives of planning for recovery (Wolf et al. 2015). With it comes a concomitant shift from only focusing on short-term demographic viability to a focus on maintaining long-term genetic diversity, the functional connectivity among populations necessary to avoid inbreeding and maintain evolutionary potential, as well as aspects of ecological function (Linnell & Boitani 2025). The result is that long-term conservation of these species requires their reintegration (by natural expansion and reintroduction / translocation) into very large parts of the European landscape as interconnected populations. This will automatically locate large carnivore conservation into European

multi-use landscapes, including a fine-scaled mosaic of protected areas, managed forests, farmlands and the edges of urban areas with all of the associated human activity and infrastructure. In essence, large carnivore conservation is an endeavour at a continental scale, where the species will need to be able to occupy, or at least traverse, most parts of the European continent across various administrative boundaries (Boitani & Ciucci 2009, Boitani & Linnell 2015).

3. Social considerations

In line with the broad changes in environmental attitudes that have occurred across the western world during the second half of the 20th and the early 21st centuries some segments of the public greatly value large carnivores for a wide range of utilitarian, economic, scientific, ethical, aesthetic, inspirational and ecological reasons (Table 1). These positive values form the motivation for the legislative and policy changes that have increasingly promoted large carnivore conservation for decades. As research has mainly focussed on the negative effects of large carnivores on human well-being (Arbieu et al. 2019, Rode et al. 2021) the positive aspects of sharing the landscape with large carnivores are often underrepresented in public debates and in the media.

However, large carnivores have also long been associated (Boitani 1995, Breitenmoser 1998) with a diversity of negative impacts on human activities (Table 2). Predation on livestock has been an issue for probably as long as livestock have been domesticated, and was clearly among the main motivations for the persecution of large carnivores that led to their eradication from many parts of the continent by the early to mid-20th century (Breitenmoser 1998). As carnivore populations have recovered, these age-old impacts have returned, often intensified by the abandonment of traditional, protective husbandry practices (Gervasi et al. 2021).

A whole range of additional controversies have also come into focus in recent decades (Linnell 2013). Conflicts with hunters, because of both real and perceived competition for shared prey and the killing of hunting dogs by wolves, are widespread (Vervaecke et al. 2025, Mugnari et al. 2025). Fear for personal safety is widely reported among the public (Bombieri et al. 2019, Linnell et al. 2002, 2021) and may influence perceptions toward large carnivores and both traditional (e.g. hunting) and modern (e.g. tourism or recreation) activities (Støen et al. 2022).

The combination of positive and negative aspects of large carnivore conservation is a diverse set of economic, material, social and political conflicts. In many cases the same issue can be perceived as a positive aspect by some people and a negative one by others (Martin et al. 2020, Palacios-Pacheco et al. 2024), creating a very complex situation. As a result large carnivores have also become a highly symbolic part of wider social, cultural and political conflicts among different segments of the public (Chapron & López-Bao 2014, Hovardas 2018, Niedzialkowski 2023, Skogen et al. 2017, von Hohenberg & Hager 2022). Furthermore, the issue of large carnivore-human relationships is intertwined with the wider discussion over the appropriateness of different human-animal relationships (e.g. animal welfare and animal rights) and shifting ideologies within biodiversity conservation in general (Mace 2014, Kaltenborn & Linnell 2022).

The tangible and intangible benefits and impacts of large carnivores, and the disputes over the way they should be viewed and managed, are very much on the political agenda of regional, national and continental politics in Europe. The consequence for an understanding of coexistence is that there are diverse human interests that need to be considered, and that some people perceive large carnivores negatively, while others are neutral or positive towards their presence (e.g. Giergiczny et al. 2022). These divisions fall along many gradients depending on context, including rural-urban location, traditional-modern mindsets, left-wing to right-wing political orientation, dominionistic to mutualistic values, as well as factors like sex/gender, education and occupation (Dressel et al. 2015).

The overall implication of these issues is that there are many different views about large carnivore conservation and about how ambitious their conservations should be in terms of distribution and density, and the extent to which they should be managed.

Table 1. *The main motivations, values and benefits associated with large carnivore conservation in Europe. It is important to note that not all potential effects are well documented, and most are likely highly context dependent and species-specific. Sources: Arbieu et al. (2020), Bruskotter & Wilson (2014), Cirovic et al. (2016), Fischer et al. (2013), Giergiczny et al. (2022), Knott et al. (2014), Linnell & Immerzeel (2023), Martin et al. (2020), Palacios-Pacheco et al. (2024), Rode et al. (2021), Sebé et al. (2022), Tanner et al. (2019).*

Main dimensions	***Explanation and examples***
Biological control and direct benefits	*Large carnivores may have a limiting or regulatory impact on potentially conflictful prey species (i.e. reducing damage to forests, crops or vehicles caused by large herbivores).*
	In some circumstances, large carnivores can have a limiting impact on feral, alien or invasive species.
	Large carnivores may be able to limit the spread of diseases among prey populations.
	Large carnivores may be able to limit the populations of meso-predators.
	Large carnivores can remove carrion, and thereby may reduce veterinary risks.
Ecological functions	*Large carnivores provide carrion for scavengers.*
	Large carnivores can help disperse seeds over long distances.
	Large carnivore impacts on prey populations may have cascading effects on vegetation and other biodiversity (including above and below ground and aquatic and terrestrial species) as well as on supporting and regulatory mechanisms such as water cycle and carbon cycles.
Future options	*Conserving large carnivores provides more options for future generations to decide for themselves how to manage and conserve nature.*
Learning and inspiration	*The presence of large carnivores provides artistic or creative inspiration and the opportunity for learning.*
Aesthetics	*Ecosystems or landscapes are perceived as having greater aesthetical value when large carnivores are present.*
Ethics	*Ensuring large carnivore conservation is viewed as a moral imperative and the species as well as their ecological role have intrinsic value.*
Experiences	*Sightings of large carnivores or signs of their presence provide positive nature experiences and enhance recreational value.*
Ecotourism	*Large carnivores may provide opportunities for wildlife viewing tourism, or their presence may be used to help enhance other nature-based tourism products and create a valuable brand for a region and thus providing economic benefits for local communities.*
Social cohesion and social innovation	*The controversies around large carnivores may promote dialogue and mutual understanding between different interest groups as well as offering employment opportunities for shepherds, fencing specialists, volunteers etc.*
Improvements to livestock husbandry	*The additional funding and other resources that large carnivore presence often releases may allow improvements in husbandry by partly funding increased surveillance and better fencing which can reduce other mortality causes.*
Identity	*The presence of large carnivores may support rural identities and cultural heritage through a focus on their historical, mythological and present-day interactions and association with the species.*
Symbolism	*Large carnivore conservation is symbolic of changing human relationships*

	with nature.
Knowledge	*The associated research and monitoring activities help advance multi-disciplinary knowledge about social, political and ecological processes.*
Hunting of large carnivores	*Recreational pleasure, sense of skill mastery, sense of empowerment, social activity and sense of identity associated with the process and the result of hunting large carnivores.*
	Economic benefits to local hunting clubs and communities from sale of trophy hunting.

Table 2. *The main conflict dimensions and costs associated with large carnivores and rural communities. Taken from a series of reports and analyses that have been commissioned by the European Commission and the European Parliament during the last 15 years and key review articles: Blanco & Sundseth (2023), Blanco et al. (2025), Boitani et al. 2015, Hatlauf & Fuchs (2024), Hovardas et al. 2017, Hovardas (2018), Linnell (2015), Linnell & Cretois (2018), Marsden et al. (2023), Martin et al. 2020, Rode et al. (2021), Salvatori et al (2020). It is important to note that not all potential effects are well documented, and many are context dependent and species-specific.*

Main dimensions	***Explanation and examples***
Livestock conflicts	*Large carnivores kill and wound livestock (sheep, goats, cattle, horses, semi-domestic reindeer, farmed deer, domesticated honeybees) leading to accountable (economic) and non-accountable losses.*
	Large carnivores may cause indirect impacts on livestock production, such as inducing stress, behavioural change and additional movement among herds.
	Extensive livestock production is an increasingly marginal activity with low profit margins. Damages are one additional burden, requiring additional labour and costs.
	Livestock protection is often labour intensive, which not all farmers can afford, and requires expertise which they may lack.
	Many livestock producers already feel marginalised, undervalued and neglected by decision-makers and society which may be enhanced by large carnivore – livestock conflicts.
	There may be legal obstacles to adapting livestock protection to large carnivore presence (e.g. labour laws, restrictions on use of free-ranging dogs).
	Lack of funding, or access to funding, to upscale livestock protection measures
	Compensation systems are not always efficient in terms of procedures and amounts paid don't compensate losses and indirect impacts.
	Lack of sectorial cooperation between environmental and agricultural sectors.
	Some pastoral systems are hard to protect (e.g., extensive grazing in remote areas, or due to topography).
Crops and orchards	*Brown bears can cause damage to forests, agricultural crops and orchards.*
Impact on outdoor recreation	*Perception that outdoor recreation (including tourism) will decline because of fear, meadows will disappear because of afforestation if livestock grazing is abandoned and concern about fencing and livestock guarding dogs making the landscape less permeable for other land users.*
Impact on recreational hunting	*Real or perceived competition for game species can decrease hunting experiences and threaten rural economics from sale of hunting licenses and opportunities.*
	Killing of hunting dogs and need to change hunting practices.
	Hunters may feel that their status and activity are under threat, and that they are exposed to the additional risk of close encounters with large carnivores..
Killing	*Restrictive legislation and legal challenges make lethal control / culling /*

carnivores	*hunting of large carnivores challenging with impact on sense of control and ability to exploit large carnivores for hunting.*
Fear	*Fear for personal safety. Avoidance of some locations and activities during work or recreation.*
	Fear of losing cultural heritage and traditional activities.
Injury	*There is a very low, but non-zero risk of injury or death caused by bears and, to a lesser extent, wolves.*
Knowledge	*Competition between scientific knowledge and local, experience-based knowledge.*
	Fake news and misinformation create controversy, insecurity and conflict.
	Lack of effective monitoring programmes and research projects in some regions of Europe. Poor information flows. Failure to involve rural residents and stakeholders. Poor accessibility and/or communication of research results to lay people
Power	*Many interest groups often feel powerless with respect to other groups and institutions, feeling that large carnivores are given too much, or not enough, protection.*
Social change	*Large carnivore conservation is often symbolic of wider societal changes associated with rural-urban migration and modernity, such that the carnivores are used as surrogates or scapegoats for wider grievances and concerns.*
Values	*Large carnivore conservation may represent fundamentally different values about the human-nature relationship compared to traditional rural values.*
Media	*Traditional media often sensationalise conflicts while negative aspects spread rapidly and disproportionately via social media. Poor communication of good practices and examples of coexistence.*
Political polarisation	*Politicians capitalise on large carnivore conflicts, leading to polarisation and a more difficult cooperation environment. Multiple interest groups feel that they are ostracised or demonised because their positions are misrepresented.*
Economic	*Large carnivores are associated with high costs linked to compensation schemes for damage, mitigation measures to adapt to their presence, monitoring and research activities, and institutional engagement.*

4. Legal and policy considerations

European conservation of large carnivores is governed by two central international legal frames: the Bern Convention (opened for signature in 1979 and administered by the Council of Europe, currently with 50 contracting parties) and the Habitats Directive (adopted in 1992 and administered by the European Union, currently binding for 27 member states), in addition to more global instruments like the Convention on Migratory Species and CITES (Trouwborst 2010, 2015, Trouwborst et al. 2017). The Habitats Directive is built on the Bern Convention, and within these two international instruments are a diversity of national and regional legislations which can be more (but not less) restrictive than the international frames. These two instruments mandate the conservation of large carnivore species and impose restrictions on human impacts, especially the killing of individuals, with the degree of protection dependent on the annex / appendix on which a given species, subspecies or population, is placed.

The protection status of large carnivore species varies according to which list they are included in under the different instruments in different locations, and the status of the wolf was modified in spring 2025 through a reduction in the default level of protection from strictly protected to protected under both the Bern Convention and the Habitats Directive. However, irrespective of the specific degree of protection, all countries are required to achieve or maintain conservation goals that ensure long-term viability and a degree of ecological functionality. These goals are not specified in clear measurable metrics, although there are multiple guidance documents that try to align legal terms with ecological and social metrics (e.g. Linnell et al. 2008, Linnell & Boitani 2025). Although the exact goals of European nature conservation may still remain contested, the fact that the conservation status of many species and habitats is currently regarded as “unfavourable” implies that there is a need for considerable further efforts across the continent to increase the ambition and achievement of nature conservation in general. This gap between the present situation and ambition explicitly lies behind the recent adoption of the European Nature Restoration Regulation in 2024.

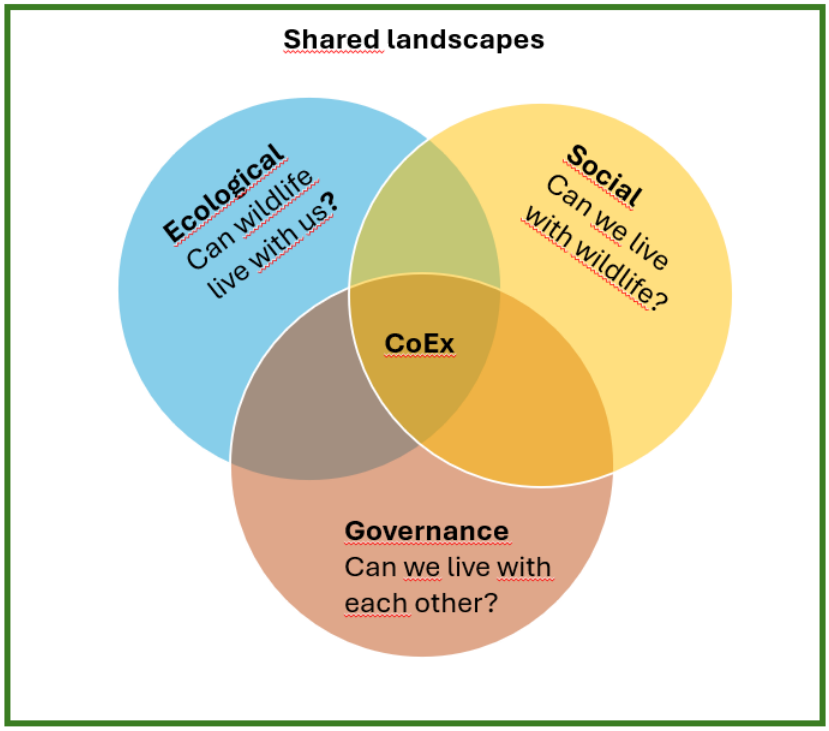
In terms of understanding and operationalising large carnivore conservation, the main point is that there are continental scale restrictions on national or regional freedoms to act. Although these external constraints are necessary to promote the large-scale cooperation that is required from a biological perspective, they may also become additional narratives in social conflicts (Linnell et al. 2017, Trouwborst 2015).
It is also important to consider that wildlife conservation policy does not exist in a vacuum, and that the same conservation arena (in this case, the wider European multi-functional landscape) is also the subject of multiple other policy goals imposed by a diversity of other space-dependent sectors, ranging from agriculture and forestry to transport, mining, energy, tourism and defence. It is therefore necessary to look at the

policy mix operating in any given arena (de Boon et al. 2020). There are also a range of other conventions and directives that safeguard human rights, minority rights, cultural heritage and a broad European social policy agenda for information, participation and involvement. There is also a rising focus on the need for all biodiversity conservation to include a stronger emphasis on social justice (Milner-Gulland 2024) and power balance (Lécuyer et al. 2024). The manner in which these social, economic, cultural and political considerations should be considered in practice when setting the legally mandated level of conservation ambition has been contested (Linnell & Boitani 2025) although a recent ruling by the Court of Justice of the EU (CJEU ruling on case C-629-23 from June 2026) has brought some clarity to the discussion.

5. The multiple dimensions of coexistence

Building on these foundational considerations, our experience has led us to conceive of coexistence as having at least three major dimensions (Figure 1). In the following, we will phrase these as questions that all need to be answered in the affirmative for the outcome to be called “coexistence”.

Figure 1. *The three dimensions of coexistence, where coexistence (CoEx) can only be achieved at the intersection of the three dimensions.*



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5.1. The ecological dimension: Can large carnivores live with us?

This is essentially an ecological question about the ability of large carnivores and their main prey species to coexist in human-modified, multi-use landscapes (Cretois et al. 2021). The last decades have seen an explosion of ecological research on large carnivores across many parts of Europe. Although this has been unevenly distributed across the continent and species, and some knowledge gaps remain, we are at the stage where these species are among the better studied wildlife species in Europe. These studies document a wide range of ways in which human land use, disturbance, wildlife management and anthropogenic mortality can restructure ecosystem processes and influence the behaviour, reproduction, food intake, ecological interactions and survival of wildlife (Gerber et al. 2024, Krofel & Jerina 2016, Kuijper et

al. 2016, 2024, Oliveira et al. 2024). However, the research has also revealed these species to be remarkably adaptable, in terms of both their tolerance for ecological situations and anthropogenic activity.

Large carnivores have shown an ability to adapt to human influences and live in modified environments in relatively close proximity to human habitations and activities, such that the viability of their populations is compatible with a wide range of human land uses (Cimatti et al. 2021, Cretois et al. 2021). The most serious long-term threat to this viability can be linear infrastructure (roads and railways, especially when fenced, and increasingly veterinary and border security fencing), which fragments otherwise suitable habitat into smaller pieces and increases mortality. Appropriately designed wildlife crossing structures represent a functional mitigation to parts of this problem (Kusak et al. 2009, Soanes et al. 2024). In some parts of Europe (the extreme south and north), there is also a scarcity of wild prey (Mattisson et al. 2014, Zlatanova et al. 2014). But overall, very large parts of the European landscape represent potential suitable habitat for large carnivores, although it is important to note that the species vary greatly in their tolerance thresholds to anthropogenic impacts, with wolves being far more tolerant than Eurasian lynx, wolverines and brown bears (Cretois et al. 2021).

An important caveat on this optimistic note concerns mortality. Anthropogenic causes of mortality tend to dominate among all large carnivores (e.g. Premier et al. 2025). This mainly comes from legal hunter harvest, lethal removal for management purposes, illegal killing, and collisions with vehicles. In some regions, the sum of these causes has led to population stagnation and decline (and even a few local extinctions; Kaczensky et al. 2011), however in the bigger picture large carnivores are able to tolerate relatively high levels of mortality. Whether carnivores persist in a landscape or not is more likely to depend on ensuring that mortality remains within demographically tolerable levels than on habitat quality, for example.

Given that enough connectivity can be ensured and anthropogenic mortality limited, it appears that there is sufficient space in modern-day Europe to support long-term viable populations of large carnivores. Especially for wolves, it is possible to imagine that most of the continent's populations will become increasingly interconnected. There are currently more than 50,000 large carnivores in Europe (excluding Russia) and one or several species are found across an area representing more than half of the continent (Kaczensky et al. 2024). This area has increased over the last decades. Habitat is not a proximate bottleneck on large carnivore conservation in Europe, and an important portion of potentially suitable habitat remains unoccupied (e.g. Scharf & Fernández 2018).

However, conservation approaches have undergone many changes in recent decades

(Kaltenborn & Linnell 2022, Mace 2014), moving from an avoidance of extinction (an easily quantified concept through Population Viability Analysis for example) to recovery (a much harder state to define) (Linnell & Boitani 2025). During the early days of the LCIE in the 1990s (and when many of the main legal instruments were first drafted) it was widely accepted that the recovery ambition was focused on reestablishing demographically viable populations that would mainly occur in human-dominated landscapes, where it was implicit that their ecological role would be very different from that in a hypothetical natural environment with minimal human intervention (Linnell et al. 2015). In recent years there has been a rapid expansion of new conservation approaches (Kaltenborn & Linnell 2022, Mace 2014), including those that fit under the broad umbrella of "rewilding" (Nogués-Bravo et al. 2016). Many of these new approaches not only call for the recovery of demographically and genetically viable populations of species such as large carnivores but also call for the recovery of natural ecosystem processes (see also Table 1). Although large carnivores are clearly ecologically important species (Ripple et al. 2014), their top-down influence on ecosystems will vary with ecosystem type (Terborgh & Estes 2010) and can be severely constrained in human-dominated landscapes (Ausilio et al. 2021, Gerber et al. 2024, Kuijper et al. 2016, 2024, Linnell et al. 2005, Newsome et al. 2017, Ordiz et al. 2013, García-Rodríguez et al. 2021). This implies that fostering their recovery to levels that restore their full potential ecological functions would require reducing human influences on the landscape (including human influence on habitat via forestry and agriculture and human influence on prey via supplementary feeding and hunting) (Figure 2).

There is therefore a clear, but complex and contextual, potential trade-off between gains on the ecological functions that large carnivores (can) have on ecosystems, with the level of impact on existing property rights, recreational and economic activities and land uses (i.e. the positive values in Table 1 and the impacts / conflicts experienced in Table 2). Although permitting a greater degree of ecological functionality may be possible within some protected areas and for some of the ecological processes, it is unlikely to be a viable strategy across large areas of the wider landscape and for all functions provided by, or associated with large carnivores (Table 1). Overall, this question of how far to let large carnivores recover beyond the minimum that is needed for viability is emerging as one of the main areas of conflict among stakeholders.

5.2. The social dimension: Can we live with large carnivores?

Living with large carnivores concerns both the willingness of people to tolerate large carnivores in relative proximity to where they live, work and engage in recreation, and the ability of people to adapt their practices, mindset and psychology to the presence of large carnivores. One of the hallmarks of European large carnivore conservation has

been a 30-year tradition of complementing ecological research with social science research (Johansson et al. 2016). The human relationship with large carnivores and their management has been explored through the lenses of social psychology, anthropology, ethnography, history, philosophy, sociology and political science. This research has effectively revealed the multi-faceted, complex, contradictory and ever-shifting relationship that people have had towards large carnivores (Linnell 2013). It gives insights into both the motivations to conserve carnivores and the associated conflicts. The results of many studies show highly variable, and often polarized, perspectives, but there is a broad willingness among the wider public to support carnivore conservation, albeit with a widespread NIMBY (Not-In-My-Back-Yard) element (e.g. Bruskotter & Wilson 2014, Dressel et al. 2015, Kansky & Knight 2014, Karlsson & Sjöström 2017).

Conflicts related to large carnivore presence emerge from the many different forms of impacts (i.e. not just economic or material losses, Table 2) and recognising this diversity has come a long way in Europe. Yet it still remains a constant struggle to communicate that conflicts go beyond livestock damages, and that even livestock damages are not just about numbers of animals and euros lost but rather touches on livelihoods, identities and diverging visions of the desired present and future states of the European countryside (Salvatori et al. 2021, Böttinger et al. 2024).

Responding to these conflicts requires adaptation. Adaptations to promote coexistence (Carter & Linnell 2016, 2023), includes (1) adopting or maintaining appropriate livestock husbandry practices, (2) introducing more restrictive garbage disposal practices, (3) involving the public and stakeholders in species monitoring through citizen science, (4) teaching citizens to avoid behaviours that increase risk of injuries from large carnivores, (5) modifying game hunting quotas and hunting practices and artificial feeding of wildlife, (6) habitat restoration to allow for wild ungulate recovery, (7) sometimes managing large carnivores through hunting or selective killing, (8) diversionary feeding, (9) creating and training professional emergency response teams, (10) introducing economic mechanisms such as compensation, performance incentives, insurance or subsidy schemes (Figure 2, Boitani et al. 2015, Dickman et al. 2023) and (11) developing a culture of land sharing instead of land sparing with wildlife (Rode et al. 2021). The outcomes of these adaptations can vary considerably, from highly effective to counter-productive, and can depend on local context and the species concerned.

For livestock protection, in particular, there are millennia of experience with traditional measures such as shepherds and livestock guarding dogs (Linnell & Lescureux 2015), as well as modern developments such as electric fencing (Salvatori & Mertens 2012, Bruns et al. 2020, Oliveira et al. 2021). Unfortunately, despite decades of positive and successful experience with applying these methods within the frames of conservation and management projects, there remains a paucity of documentation of this effectivity

within the peer-reviewed scientific literature (Treves et al. 2016, van Eeden et al. 2018). A widespread lack of centralised conflict monitoring data exacerbates large scale analyses (Selva et al. 2023).

The fact that fear is a widely cited issue, especially when it comes to bears and wolves (in contrast to lynx and wolverines), has led to a range of interventions based on psychological insights to help rural residents and outdoor recreationists learn how to behave in areas with large carnivores and how to overcome fear (Johansson et al. 2018, 2019). Raising awareness of the positive aspects of large carnivore presence, which are usually under-represented, can also play a central role in changing narratives (Arbieu et al. 2019, 2020, Rode et al. 2021).

Some adaptations can be difficult (economically and logistically) and some are controversial. This especially concerns the issue of if, when, and by whom large carnivores should be killed. The killing of wildlife in general, and large carnivores in particular, is highly controversial among both the public and professionals alike and is emerging as a major fault-line in societal values towards nature (Lute et al. 2018). This is partly related to a lack of adequate evidence for the effectivity of lethal control to mitigate large carnivore conflicts with livestock (Grente 2021, Lorand et al. 2022) but also appears to be infused by more value-based ideals stemming from compassionate conservation and animal rights (Kaltenborn & Linnell 2022).

5.3. The governance dimension: Can different stakeholders live with each other?

The last few decades of research have clearly demonstrated that many of the most intense conflicts are not with carnivores per se, but rather are related to disagreements among different segments of the public about the way carnivores or the natural landscape should be managed (Table 2, Linnell 2013, Skogen et al. 2017). Proximately this often focuses on the issue of whether large carnivores should be lethally controlled and hunted, how much priority should be given to extensive agriculture, forestry, and hunting interests as opposed to recreational, tourism, and conservation interests, and how the competing interests of different stakeholder groups are prioritised. Ultimately it touches on diverging visions of nature and the fundamental relationships between people and nature in general, and between people and wild animals in particular, as well as the power dynamics between stakeholders (Lecuyer et al. 2024, Pettersson et al. 2023). The public debates about large carnivore conservation are becoming increasingly polarized, with NGOs and other groupings of stakeholders adopting strong positions on both extremes, increasingly using legal challenges at regional, national and international levels. The controversial process around downlisting the protection status of wolves in Europe initiated by the European Commission (Fleurke & Trouwborst 2025),

as well as legal challenges in response to efforts to remove individual bears responsible for attacks on people (Groff 2023), are just two examples of this increasingly fractious situation. A further challenge is represented by the unclear position of the majority of the public that do not represent clearly identifiable stakeholder groups.

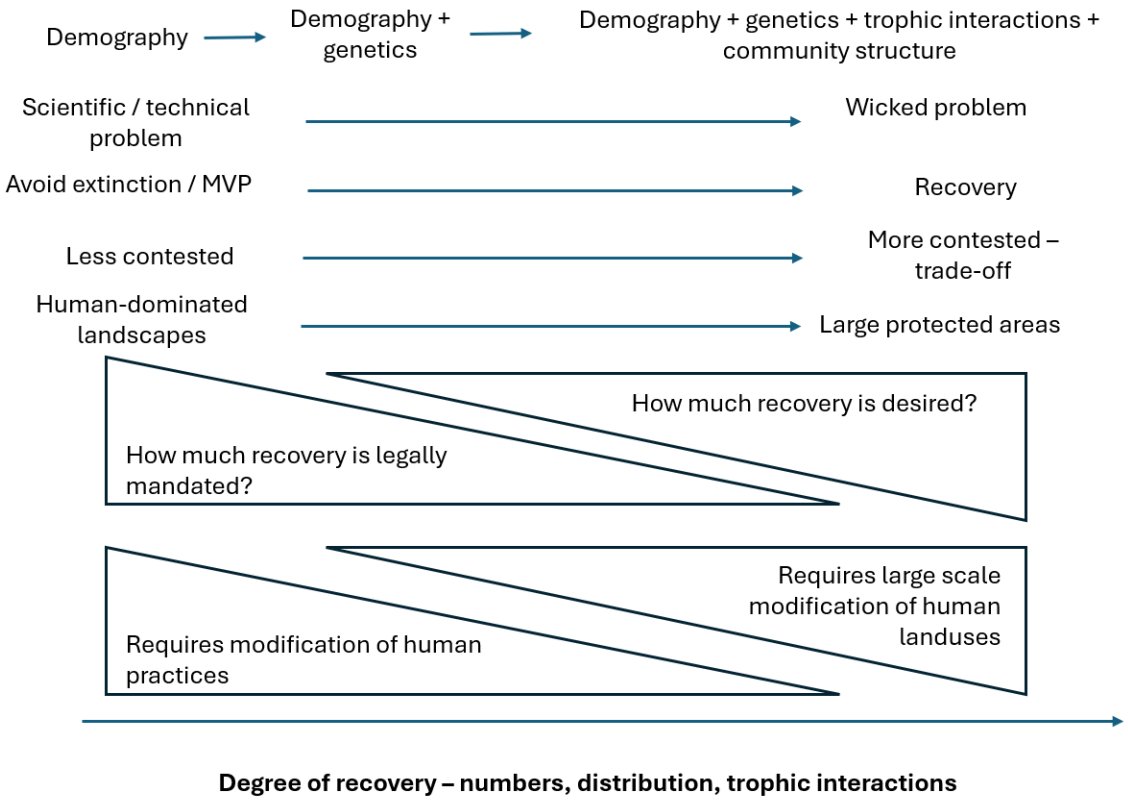
Balancing competing interests and values of different groups is the job of good governance mechanisms that secure the legitimacy of both the decision-making process and the specific outcomes. Principles such as transparency, inclusion, subsidiarity and accountability are enshrined in European Union and Council of Europe legislation and charters. With conflicts that touch on identity-based issues and deeply held values, it is unlikely that complete consensus will be possible on many issues. Therefore, good governance should ensure that common ground is identified and that different groupings feel that decisions are reached in a manner that is fair and which satisfies a sense of justice, akin to the wider democratic political process. It is our clear belief that without good governance, there can be no effective coexistence in the sense that we argue in this paper. It should be noted, however, that there are competing ideas of what constitutes good environmental governance, with some calling for more ambitious, top-down decision making (Chapron 2020, Treves et al. 2017), and others calling for more participatory, bottom-up processes (Redpath et al. 2017, Salvatori et al. 2020). Good governance is also necessary for participatory processes. When the "tyranny of a minority" and the prevalence of conflicts of interest are entrenched, conflicts become chronic, or irreconcilable positions and polarisation dominate (López-Bao et al. 2017). Whereas top-down processes may be able to force (through a "tyranny of the majority") carnivore conservation (i.e. co-occurrence or co-habitation), our emerging understanding of coexistence requires a far greater focus on participation, compromise, contextualisation and bottom-up engagement in governance where those affected most get a clear voice (Redpath et al. 2017).

Establishing good governance is especially challenging considering the multi-level nature of European institutions where municipal, county and regional levels are embedded within national and trans-national level institutions. There is even more complexity in federal and decentralised states, where the delegation of authority to sub-national levels is more formalised. European policies in general favour good governance via subsidiarity (the principle of bringing decision-making as close to the influenced citizens as possible), but this can be at odds with the ecological requirements of large-scale (transboundary / transnational) coordination of habitat and population level management for large carnivores (Boitani & Ciucci 2009, Linnell et al. 2008). There is also a need to coordinate between different policy sectors which may operate at different scales (de Boon et al. 2021). Overall, there is a need to balance large scale (top-down coordination) and local scale (bottom-up contextualisation) elements. Coordination is not the same as standardisation or "one-size-fits-all", and there is both

a considerable need, and scope, for contextualised freedom of action within broad frames. However, it must be acknowledged that facilitating the coordination of, and two-way dialogue between, these multiple levels remain a major challenge for governance structures in general, and large carnivore conservation in particular.

One example of an innovative governance structure is a series of stakeholder platforms that the European Commission has fostered at both central and regional scales during the last decade to bring stakeholders and their organisations into direct dialogue with central decision makers, helping to foster cross-scale and cross-sectorial dialogue and stakeholder empowerment (Hovardas et al. 2017, Salvatori et al 2020). A solid platform of robust scientific knowledge is also a prerequisite for effective decision making, but scientific facts are often hotly contested or outright ignored in politicised conflicts. Accordingly, good examples of best practice include the co-generation or co-creation of knowledge where various stakeholders participate in data collection, for example to support population monitoring of large carnivores, which also increases trust in the results (Fležar et al. 2025, Ražen et al. 2020). This is the objective of a current Horizon Europe funded project Co-creating Coexistence (https://cocoproject.eu/), which brings together different kinds of knowledge—from science, traditional practices, and personal experiences—to inform process that allow the negotiation of acceptable coexistence strategies. These efforts are far from trivial given the current discussions on how to work in a post-truth world, where basic facts are often hotly contested and become instrumentalised in political debates (Komi 2025).

***Figure 2**. Diverse consequences of increasing ambition in conservation / recovery for large carnivores. With increasing levels of conservation ambition and large carnivore recovery there will be an increasing need to invest in the social and governance aspects of negotiating management regimes with stakeholders and the public. There is also a change in the extent to which modification of human practices is sufficient and where large-scale land use modification is needed. Sources: Linnell & Boitani (2025), Linnell et al. (2005), Wolf et al. (2015).*



6. Can Europeans coexist with large carnivores?

Based on the lines of argumentation outlined above we want to underline a difference between co-occurrence, where carnivores and people share space, and coexistence. Based on the emerging body of scholarship and conceptual thinking (Carter & Linnell 2016, 2023, Ouvrier et al. 2025 Pettersson et al. 2022, 2023, Pooley 2024, Pooley et al. 2021, 2022, Zimmermann et al. 2023) as well as our collective experience, we conceive of coexistence as requiring consideration of all three dimensions (ecological, social, governance) that we discuss above. It appears that we can maintain or achieve co-occurrence and some aspects of short-term coexistence in some circumstances along each dimension when considered in isolation. But it is our contention that sustainable coexistence (Carter & Linnell 2023) can only occur at the intersection of all three dimensions. Therefore, the answer to the question of whether Europeans can coexist with large carnivores requires a "yes" to each of the three questions in the headings of the previous sections (Can carnivores live with us? Can we live with carnivores? Can different stakeholders live with each other?).

One key topic lies in the relationship between conflict and coexistence. From the above sections, it should be clear that some conflicts can never be "solved" and win-win solutions may remain elusive (Hovardas & Marsden 2022). Many of the economic and material impacts can be greatly reduced or buffered, although some of these impacts, such as those concerning hunting interests or semi-domestic reindeer herding, are far more intractable. A combination of education, training, economic support, adaptation of practices and good governance can help channel conflicts about social and governance issues into more constructive channels. However, it is unlikely that there will be a future where all stakeholders agree on all goals, where all feel equally empowered, or where all dimensions can be maximised. There will therefore always be trade-offs between the different dimensions, such that workable outcomes will always represent a compromise. It will be important, however, to avoid making bad compromises that do not provide viable outcomes for either party in the conflict, or which fail to get to grips with the real and difficult issues.

Conflicts around social and governance dimensions will always persist, offering opportunities for constructive debates that need to be given adequate space. In effect, this means that coexistence does not necessitate the absence of conflict, but that management of such conflicts should be embedded in large carnivore conservation policies and taken as a source of social engagement providing feedback to legitimate political approaches that negotiate between competing interests.
It may also be possible to reconcile competing visions of coexistence by doing things in different ways in different spaces. This will, for example, open up for different countries to adopt different practices in line with their own pre-conditions and desires, or for a

more fine-scale spatial differentiation in practices in different regions or within protected areas. As long as the basic biological requirements for interconnected viable populations are met, there is considerable scope for much variation in practice.

In a world undergoing constant social, political, economic, cultural and environmental changes, it is clear that the target we are trying to reach is going to be constantly shifting. The actors competing for influence and taking part in the negotiation will constantly change. Human society is also based on a constant turnover of individuals, and just like in school education, each cohort and each generation needs to be introduced into the foundations of knowledge and experience and be given space to make their own mark on the world. The result is that coexistence is much more likely to be a never-ending process of negotiation or ideal aspiration rather than a stable end state (Carter & Linnell 2023). This is essentially a recognition of the political nature of wildlife conservation, because politics is also a never-ending process without an endpoint. It also underlines that the current and future bottlenecks for achieving coexistence are not primarily in the ecological or social dimensions (which have both received much research attention), but lie in the governance dimension. This is because it is the governance structures that ensure the legitimacy of the ways in which different interests will constantly negotiate their relative influence.

7. Conclusions

This contribution adds to a growing body of scholarship trying to conceptualise and operationalise coexistence (e.g. Carter & Linnell 2016, 2023, Pooley 2024, Pooley et al. 2021, 2022). Our experience is summarised in Table 3 which presents some guiding principles for coexistence in a European context. The added value of our approach consists in (1) identifying constraints and prerequisites for coexistence, (2) breaking it down into three dimensions that correspond to different disciplinary and conceptual components, (3) conceptualising coexistence as an open-ended process of negotiation over compromises rather than a stable state, and (4) exploring some of the areas where there is scope for negotiation, as well as ecological constraints on this negotiation space. We are also explicit in our recognition that there is not a single approach to coexistence; instead, we advocate for a coordinated diversity of locally-adapted interpretations. Rather than being viewed as a stable state, we view coexistence as an open-ended dynamic and an adaptive process of finding workable compromises across ecological, social and governance dimensions.

The priority for future advances in coexistence research / practice should lie in exploring what different stakeholders and the wider public think about these ideas, and exploring their preferences for different policy options and different compromises. Scholars and conservationists have spent decades studying stakeholders to understand their perceptions and experiences of conflicts. It is now time to complement these conflict studies with empirical studies of how contextualised coexistence can be constructed and negotiated with the people who are being asked to share the landscape with large carnivores and the wider public (Hovardas & Marsden 2022, Redpath et al. 2017) across the diversity of circumstances that characterise Europe.

Table 3. *Principles for coexistence with large carnivores, including those with broad agreement and general applicability as well as those with a greater degree of contextuality.*

Principles with broad agreement and general applicability
Coexistence will inevitably require some level of compromise between different interests.
Coexistence will vary in space and in time.
Large carnivore species share many common properties, but there are also clear differences between them.
The long-term demographic and genetic viability of large carnivore requires large and interconnected populations. This implies that: - They will need to be present in both protected areas and multi-use landscapes, and will need to be reintegrated into a significant proportion of the European continent's area. - There will need to be a high degree of cooperation between administrative units at sub-national, national, and international scales, preferably formalised through transboundary management plans. - Cooperation between different sectorial interests is essential to ensure that land use is compatible with their presence and that the landscape retains sufficient permeability.
Large carnivore conservation needs to be seen within a wider set of social, cultural, economic and ecological agendas. These includes: - Accepting that there are multiple ways of constructing and valuing nature as well as human-nature interactions. - Accepting that there are multiple legitimate land uses in shared landscapes where carnivores occur. - Understanding that many practices may have to be modified and adapted to large carnivore presence.
Large carnivore impacts on extensive livestock production are inevitable. It is therefore essential that: - Locally adapted livestock protection measures are supported through economic and technical means. - If mechanisms for paying compensation for damages are present, they need to be transparent, efficient and preferably linked to the adoption of protection measures. - When lethal control is included into the depredation management toolkit it should be linked to clearly formulated and testable mechanisms of its utility.
Managing social conflicts between different stakeholder groups with different interests requires a range of mechanisms for engagement and participation as well as balancing power dynamics and information. The need to link local level concerns and large-scale coordination is a particular challenge.
Routine population monitoring and regular research activity are essential for adaptive management of large carnivore populations and for communication with stakeholders and the public.
Coexistence requires the active and structured involvement of formal institutions at regional, national and international scales as well as the active engagement of civil society and stakeholder organisations.
Coexistence will rarely involve an absence of conflict. Rather, it is associated with the successful management of conflicts to convey legitimacy and tolerance.
Coexistence requires a sensitivity to both the subjective perceptions of different stakeholders as well as the objective and measurable realities.

Aspects associated with a high degree of contextuality
Large carnivores are ecologically important species. However: - Their ecological function varies between species, ecosystem structure and the extent of human influence on different trophic levels. - There will often be conflicts between ecological function and some stakeholder interests which will limit the extent to which the restoration of their ecological functionality is desired.
Lethal removal of large carnivores will often need to be a part of the conservation toolkit to manage animal welfare, conflicts with livestock, wider social conflicts, risks to human safety and in some contexts to provide positive values. However: - The need will vary between species. - The extent will vary with ecological, cultural and social context. - Lethal removal will always be controversial and will need to be effectively justified. - Investment in conflict prevention measures should always be the main strategy. - The investment in monitoring will need to be proportional to the extent to which lethal control is used.

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Appendix 1.

Technical reports and other online products prepared by, or in close cooperation with, the Large Carnivore Initiative for Europe that document the development of large carnivore conservation and coexistence strategies (unless otherwise mentioned pdfs should be available in the searchable database at www.lcie.org). This list does not cover peer-reviewed or scientific publications on the subject which are searchable in conventional scientific databases.

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Appendix 2

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