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REVIEW AND SYNTHESIS

Pathways between people, wildlife and environmental justice in cities

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Abstract

1. Wildlife are increasingly recognized as critical to urban ecosystems, but the impacts and benefits of wildlife on people in cities are poorly understood. Environmental justice scholarship has concluded that elements of the urban environment can create or exacerbate social inequity, but human–wildlife interactions have not been considered through this lens.
2. We conducted a literature review on urban wildlife, human–wildlife interactions and environmental justice. We triangulated between these three bodies of literature to identify trends, gaps and research needs.
3. We identified six pathways through which wildlife presence or absence, wildlife management and human–wildlife interactions in cities may lead to social injustice for people. Our review shows that wildlife affect nearly all aspects of urban life for people, including economics, participation in decision-making, patterns of urban space, human health, psychological well-being and cultural discourses.
4. Through these six pathways, urban wildlife management disproportionately impacts marginalized and vulnerable communities and benefits affluent urban residents. Contemporary intersections of urban planning, wildlife management and histories of systemic bias exacerbate existing injustices in cities.
5. *Synthesis and applications.* Though wildlife are often characterized as ‘good’ or ‘bad’ based on their effects on people, we conclude that this dichotomy perpetuates injustice for people and wildlife. Instead, we argue that a ‘just city’ fosters healthy wildlife populations through equitable decision-making. The pathways we lay out here offer a road map for incorporating environmental justice into urban wildlife management.

KEYWORDS

environmental justice, human–wildlife interactions, urban ecology, urban planning, wildlife ecology

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1 | INTRODUCTION

Cities are often viewed as primarily human spaces, distinct from 'nature' (Metzger, 2015, 2016; Wolch, 2012; Wolch et al., 2014). However, even in dense urban centres, human encounters with free-living, non-domesticated animals—or 'wildlife'—are commonplace (Katju et al., 2023; Perry et al., 2020; Soulsbury & White, 2015). Few urban residents will go a day without encountering a bird or hearing its song, and species of rats, roaches and mosquitoes are common urban dwellers worldwide (Bullard, 2008). While some species adeptly fade into the urban landscape, wildlife in all forms profoundly shape the lives of people living in cities. Human experiences of urban wildlife are diverse, varying across social identity and geography, and many such experiences remain poorly understood (Basak et al., 2022; Hunold, 2020; Hunold & Lloro, 2022; Soulsbury & White, 2015).

Over recent decades, the field of *urban ecology* has grown rapidly, revealing that cities provide habitat to important wildlife populations (Adams, 2005; Collins et al., 2021; Forman, 2014; Magle et al., 2012). Urban wildlife adopt a range of strategies to navigate and even take advantage of these unique human-built habitats (Blair, 1996; Fischer et al., 2015; McKinney, 2002). Urban ecology research makes it clear that cities are not, in fact, distinct from nature. Rather, cities are novel habitats and, in some cases, have become critical for animal conservation (Ives et al., 2016; Surve et al., 2022). Compared to non-urban spaces, human activities, infrastructure and urban planning are powerful drivers of urban wildlife ecology. Importantly, many urban spaces have also been defined by legacies of systemic racism, and these social histories can alter the wildlife ecology of a city and even the evolution of urban-adapted species (Schell et al., 2020). Urban wildlife ecology is thus produced by relationships between people and wildlife at multiple spatial and temporal scales.

As the urban ecology field grows, researchers are also studying the effects of urban wildlife on people. Human health is a particular area of focus, especially the roles of urban wildlife in the spread of zoonotic diseases (Blasdel et al., 2022; Comer et al., 2001; de Cock et al., 2023; Leibler et al., 2016; Mackenstedt et al., 2015; Rothenburger et al., 2017). Conversely, healthy urban wildlife can improve both the physical and mental health of people living in cities (Bratman et al., 2019). In fact, both people and wildlife often face linked risks to health and well-being (Murray et al., 2022). However, the benefits of wildlife in cities are often overshadowed by both their real and perceived negative impacts. Just as humans influence urban ecology through alterations of the physical environment and varied relationships with urban-dwelling species, so too do wildlife influence human society, urban planning and the distribution of green and grey space through their various impacts, benefits and relationships with humans (Douglas, 2012). Thus, through complex arrangements of impact, benefit and perception, human-wildlife relationships co-produce urban landscapes, urban ecologies and human social patterns, so much so that it would be accurate to describe cities as multispecies settlements (Douglas, 2012; Fieuv et al., 2022; Houston et al., 2018; Hubbard & Brooks, 2021; Kaika & Swyngedouw, 2011; Shingne & Reese, 2022).

In parallel with the development of urban ecology, the field of *environmental justice* (EJ) has transformed our understanding of the urban environment. EJ research has demonstrated how a range of environmental harms, such as the presence of toxic chemicals and industrial sites, disproportionately impact marginalized and vulnerable communities, especially people of colour, Indigenous communities and low-wealth groups (Agyeman et al., 2016; Bullard, 2008; McGregor et al., 2020; Mohai et al., 2009; Pellow, 2016; Whyte, 2011). Not unlike research in urban ecology, EJ scholarship demonstrates that the environment is not just something 'out there' but a defining feature of human life across all the places people 'live, work, learn, play, and worship' (Adamson et al., 2002). Such insights are also critical for conservation since the same social and economic forces contributing to elevated environmental and climate risks for people can also negatively impact wildlife (Cannon et al., 2023).

Wildlife are an essential part of the urban environment to which EJ research has paid insufficient attention. The converse is also true: urban ecology has so far rarely incorporated insights from environmental justice (Bowser & Cid, 2020). Theory and practice from EJ can thus provide essential insight into living with and managing wildlife in cities. Although research on urban wildlife has progressed, we have a poor grasp of how the benefits and burdens of human-wildlife relationships may be inequitably distributed in cities (Langhans et al., 2023; Lindahl & Magnusson, 2020). While explorations of the intersection of EJ and wildlife are growing, researchers have focused primarily on issues of human-wildlife conflict in rural areas (Basak et al., 2022; Bourgeois et al., 2023; Brackowski et al., 2023; Harris et al., 2023; Kato et al., 2019; Martinez et al., 2023; McInturff et al., 2021). Physical, ecological and social conditions in cities differ markedly from rural areas, necessitating a thorough examination of urban human-wildlife relationships through an environmental justice lens. Existing forms of injustice in cities have been well documented, but the extent to which they are drivers—or outcomes—of interactions between people and wildlife demands further scrutiny.

Here, we provide an interdisciplinary review of the triple intersection of literature on cities, wildlife and environmental justice (Figure 1). Previous scholarship has begun considering injustices across species, often termed *multi-species justice*, but we centre our analysis on injustices for people, which have received comparatively less attention within this triple intersection (Celermajer et al., 2020). We demonstrate that patterns of urban wildlife ecology and management have profound consequences for people in cities, exacerbating existing inequities through multiple pathways. We identify and describe six such pathways by which the presence, absence and management of urban wildlife contribute to environmental injustices (Figure 2; Table 1). These injustices manifest not just through impacts that wildlife create but also frequently through the benefits they provide. More than wildlife themselves, systemic issues like wildlife management and political decision-making are particularly important in shaping pathways between wildlife and injustice. Ultimately, we argue that a just city is one that considers

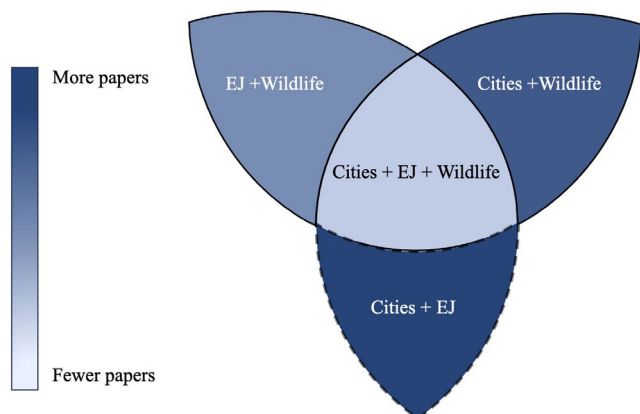


FIGURE 1 Existing literature has begun to explore intersections between environmental justice and wildlife, cities and wildlife, and cities and environmental justice. While the latter intersection was too broad for the purposes of our review (and thus shown here in a dotted line), we conducted a narrative review to synthesize findings from papers at the other two intersections shown here, and the triple intersection in the centre. Papers that integrate all three of these areas of study are rare, and this is a topic demanding further research.

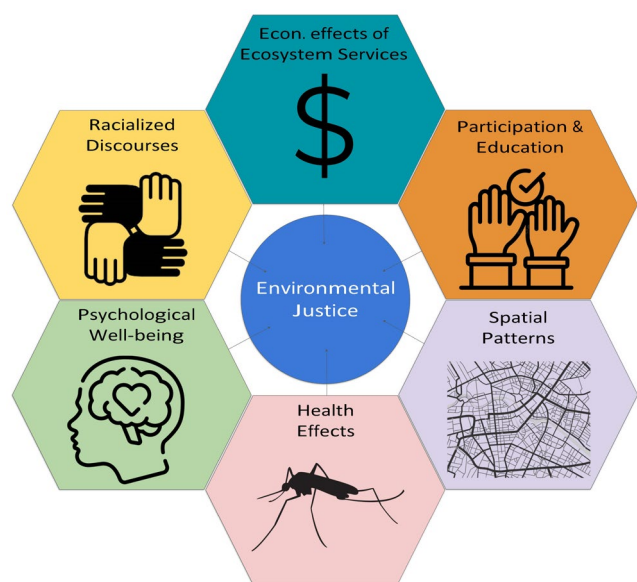


FIGURE 2 We identified six major pathways documented in the literature between people, wildlife and justice in cities. These pathways are interconnected with one another and with wildlife management. An increasing body of evidence suggests that contemporary wildlife management in cities can exacerbate existing urban social inequities.

human–wildlife relations as an essential part of urban environmental justice.

2 | PATHWAYS BETWEEN URBAN WILDLIFE AND INJUSTICE

We conducted a literature review to explore the triple intersection of cities, wildlife and environmental justice, which little scholarship has

previously considered (Figure 1). Given the complexity of this topic and the diversity of relevant fields, we chose to conduct a narrative review rather than a systematic literature review. Narrative reviews are well-suited for synthesizing insights across varied disciplines and identifying patterns in emerging or complex topics. Unlike systematic reviews, which use rigid protocols to comprehensively capture studies within narrowly defined criteria, narrative reviews allow for greater flexibility in integrating diverse perspectives and adapting to differences in terminology across fields (Greenhalgh et al., 2018). Our review involved a comprehensive literature search using key terms, snowballing of key references and drew from our authorship's interdisciplinary expertise to identify influential works across multiple disciplines. We iteratively refined our search strategy as new themes and key studies emerged, ensuring coverage of diverse literatures. This approach enabled us to comprehensively survey and synthesize diverse bodies of literature and triangulate between the three fields to identify patterns of injustice in cities relating to wildlife and wildlife management. Based on this review, we present pathways that build on theories from environmental justice, urban ecology and urban planning (Figure 2). We focus on direct pathways between injustice and wildlife, emphasizing the experiences of vulnerable and marginalized communities, particularly low-wealth communities of colour. Recognizing the complexity of relationships between people and wildlife in cities, we also discuss indirect pathways between these populations, emphasizing the interactions and overlaps between them.

The pathways we outline here build on well-established theories of environmental justice as well as more recent scholarly developments in the field, from which we construct a pluralistic understanding of environmental justice that engages with multiple areas of emphasis in the field (Table 1; Schlosberg, 2007, 2013). At its core, environmental justice (EJ) seeks to address the inequitable distribution of environmental harms and benefits, particularly as they affect vulnerable groups. Going further, EJ scholars also examine the fundamental drivers of global environmental and climate disruptions through analyses of racial capitalism and settler colonialism, which produce harms that impact both marginalized groups and all of humankind. EJ scholarship continues to diversify and enrich the theories that comprise the field. One such theory is *distributional justice*, a core concern of EJ research referring to material harms and benefits that inordinately disadvantage marginalized and vulnerable groups (Schlosberg, 2007). In pathway 1 (Ecosystem services and disservices) and pathway 4 (Wildlife and health), we detail a range of distributional justice concerns. *Participatory* (sometimes called *procedural*) justice examines who is able to participate in decision-making procedures, how participation may be restricted, and how inequities in participation further entrench broader social inequities (Agyeman et al., 2016; Schlosberg, 2007). We consider this subject in detail in pathway 2 (Participation and education in wildlife management) and pathway 3 (Spatial patterns of urban inequity). *Critical environmental justice* considers the structural drivers of injustice across society and species (Pellow, 2016), a topic we take up in pathways 3 (Urban planning) and 6 (Racialized discourses). New developments in *affective justice* (Kojola & Pellow, 2021; McInturff et al., 2021)

TABLE 1 Pathways between wildlife and social injustice in cities.

Paper section	Pathway name	Related environmental justice theories	Description
2.1	Ecosystems services and disservices of urban wildlife	Distributive justice	Prior research has described the negative economic impacts of urban wildlife, and numerous examples from global rural areas demonstrate how the negative economic impacts of wildlife damage are amplified for marginalized communities. We argue that this pathway of injustice also applies to urban marginalized communities and is further amplified by the fact that the positive economic impacts of urban wildlife are also unequally distributed throughout cities
2.2	Participation and education in wildlife decision-making	Participatory justice	Managerial outcomes often hinge upon who is able to participate in decision-making procedures and who is excluded. Equal access to participation in urban wildlife management will help ensure that the negative impacts of wildlife are not pushed on to less affluent communities by more influential actors
2.3	Spatial patterns of urban inequity	Critical environmental justice; distributive justice	Urban planning can create inequitable urban geographies that expose residents to different wildlife. In particular, typical patterns of urban green space concentrate wildlife benefits in wealthy neighbourhoods while concentrating impacts in low-income areas. Broad-scale patterns of urban planning and geography thus intersect with urban wildlife ecology to exacerbate inequity in cities
2.4	Wildlife and health	Distributive justice	Marginalized urban communities have a higher exposure to wildlife deemed as pests, which can lead to severe public health concerns. We present this unequal exposure among urban residents as a critical junction between wildlife management and environmental justice
2.5	Psychological and emotional well-being	Affective justice; recognitional justice	Environmental justice literature has only just begun to document emotions as a form of environmental harm. Here we present the links between wildlife and human psychological well-being within urban settings
2.6	Racialized discourses	Recognitional justice; critical environmental justice	Racialized discourse of wildlife often involves city authorities likening unwanted wildlife species to unwanted human neighbours, or vice versa. Documenting the occurrence of this racialized language in urban settings may reveal patterns connecting the oppression of marginalized communities and violence towards urban wildlife

take seriously the impacts and complexity of emotional harms and benefits associated with socioecological dynamics, which is central to our discussion of pathway 5 (Psychological and emotional well-being). Finally, *recognitional justice* attends to whose worldviews, ontologies and epistemologies are valued and centred by dominant institutions and cultural groups in the context of environmental justice claims-making (e.g. Martin et al., 2016), a topic with important connections to pathways 5 (Psychological and emotional well-being) and 6 (Racialized discourses). A key aim of this paper is to add richness to the expanding theoretical basis of environmental justice by linking multiple forms of justice together through the pathways we discuss below and applying them to a novel context of urban wildlife management. By framing wildlife management and human–wildlife interactions through an EJ lens, we hope to advance EJ theory by demonstrating how seemingly disparate pathways like ecosystem services, urban planning and racial discourses conspire to reinforce existing patterns of urban inequity.

2.1 | Pathway 1: Ecosystem services and disservices of urban wildlife

The intersection of ecosystem services and environmental justice is critical for understanding the importance of living with urban wildlife in cities. The concept of ecosystem services has become a foundational term in environmental literature, describing the benefits that humans derive from nature—such as clean air, water and even livable cities (Balvanera et al., 2001; Chan et al., 2016; Daily, 1997; Daily & Matson, 2008; Díaz et al., 2015, 2018; Langhans et al., 2023). Extensive research has also found that the distribution of ecosystem services, alongside the corresponding burdens or disservices, is often uneven, reflecting broader patterns of environmental injustice (Calderón-Argelich et al., 2021; Ernstson, 2013; Herreros-Cantis & McPhearson, 2021; Loos et al., 2023; Selmi et al., 2021; Sikor et al., 2013). In urban environments, this inequity is particularly pronounced: marginalized populations often face

greater exposure to environmental disservices, such as pollution and disease-related health risks, while receiving fewer benefits from ecosystem services (Bolund & Hunhammar, 1999; Douglas, 2012; Ernstson, 2013; Herreros-Cantis & McPhearson, 2021; Langhans et al., 2023). Many evaluations of ecosystem services and justice have focused on quantifiable economic impacts, aligned with the concept of *distributive justice*, but scholars have pointed out the limitations and challenges of not addressing a more diverse range of values, including non-monetary values and cultural services, to improve links between ecosystem services and environmental justice (Chan et al., 2012, 2017; Chan & Satterfield, 2020; Klain et al., 2014; Langemeyer & Connolly, 2020; Loos et al., 2023; Martin et al., 2014; Sikor et al., 2013). In this first pathway, we ground our analysis in literature on ecosystem services and distributive justice, and we take up other essential forms of justice and non-economic values in later pathways, discussing their connection to the ecosystem service concept throughout.

Some prior research has categorized the ecosystem services and disservices that urban wildlife provide (Aronson et al., 2016; Hansen et al., 2015; Lerman et al., 2020; Lyytimäki et al., 2008). Ecosystem services provided by wildlife include pollination and seed dispersal of urban gardens and green spaces, biological control of disease vectors, regulation of waste and carrion, and many others. Disservices often include acting as disease vectors, damaging urban vegetation, creating waste and carrion, and directly harming property, domestic animals, or even people (Perry et al., 2020). While further research documenting these services and disservices is needed, it is clear that wildlife produce a wide range of benefits and burdens for urban dwellers. A key question, then, is whether these services and disservices are equitably experienced in cities (Douglas, 2012).

Despite rich literatures on wildlife and justice independently, little research has examined whether the ecosystem services and disservices of urban wildlife are distributed equitably, and who is impacted. Scholarship from other domains suggests that the ecosystem disservices of common forms of wildlife damage, like personal property destruction and vehicle collisions (Basak et al., 2022; Gilbert et al., 2017), are not necessarily experienced more frequently by low-income and marginalized communities, but any such impacts that are experienced will be more acute for groups that are already vulnerable. Rural examples around the world demonstrate this pathway. Illustratively, increasing crocodile conservation in Lake Kariba, Zimbabwe, though economically beneficial to the rest of the nation, had extremely detrimental effects on local artisan fishers. Nets were regularly destroyed and too costly to replace; worse yet, livestock and people alike were increasingly attacked by crocodiles (McGregor, 2005). In the buffer zone of Bardiya National Park in Nepal, disproportionately poorer farmers lived closest to the park and suffered more crop damage from elephants compared to richer farmers situated farther from the boundary (Prins et al., 2022). Similar patterns of inequitable ecosystem disservices from wildlife have been reported in other locations (DeMotts & Hoon, 2012; Naughton-treves, 1997). While the specific forms of economic impact may differ in cities, the basic principle of elevated

and disproportionate economic burden on low-income and marginalized communities is unlikely to change.

Separately from wildlife *populations*, wildlife *management* practices may also cause disproportionate ecosystem disservices and distributive injustices. Research suggests that even when wildlife damage is economically compensated, negative impacts still occur. Barua et al. (2013) emphasize the hidden costs of wildlife damage on low-income countries in particular, including opportunity and transaction costs that are rarely accounted for in management and conservation efforts (Barua et al., 2013). In other cases, the loss of wildlife, including the loss of culturally important species for Indigenous communities, may be omitted from compensation and reparation programmes (Gregory & Trousdale, 2009). As shown clearly in the cultural ecosystem services literature, payments for services and disservices often struggle to adequately account for diverse cultural values (Chan et al., 2017; Martin et al., 2014).

Further research into the relationship between wildlife, ecosystem services and justice in cities is needed. Case studies can help link well-known forms of ecosystem services and disservices to the human populations experiencing them. Research that focuses on the beneficial ecosystem services of wildlife has special potential to build more just cities by identifying opportunities to align urban wildlife management and social justice. Drawing from rural studies scholarship, urban research can investigate how to minimize transaction costs and foster urban green spaces that help create more equitable benefits from wildlife in cities. Urban ecologists can examine whether urban wildlife adopt different strategies, like adaptation or exploitation, in areas characterized by different social identities or wealth strata (Fidino et al., 2022; Wilkinson et al., 2023). Finally, ecosystem services research can adopt a more holistic environmental justice perspective by looking beyond distributive economic questions to engage deeply with a wide range of values and constituents (Chan et al., 2016; Loos et al., 2023; Sikor et al., 2013). We discuss such opportunities in the pathways below.

2.2 | Pathway 2: Participation and education in wildlife management

Scholarship in environmental justice has increasingly attended to *participatory justice* considerations. Environmental justice scholarship has documented many instances where the level of urban investment and responsiveness to an issue varied widely, often disproportionately affecting marginalized and vulnerable groups (Agyeman et al., 2003). For example, differential investments by city, state, and federal planners and agencies have produced or exacerbated negative outcomes for communities of colour with respect to accessing public transportation (Avila, 2014; Bullard & Johnson, 1997), affordable and safe housing (Rao & Hornstein, 2023), and recreational spaces (Finney, 2014; Garcia & Flores, 2005). In the ecosystem services literature, for example, research has shown that effective provisioning of ecosystem services is only possible when power structures are recognized and local input is centred (Olsson

et al., 2020). In each of these instances, exclusions produced deleterious effects on the psychological and physical well-being of the impacted communities.

Few case studies examine whether urban approaches to wildlife management subscribe to principles of participatory justice (Langhans et al., 2023). Urban wildlife management varies widely from place to place and often involves a complex set of institutions, creating challenges for effective participation (Perry et al., 2020). However, examples from rural locales can again offer lessons. In Sabah, Borneo, Rubino et al. (2020) identified inequities in the incidence of human–elephant conflict resulting from a quintessential ‘not in my backyard’ (NIMBY) approach (Ho, 2023; McGurty, 1997) to elephant conservation, which led to differing levels of influence and participation in conservation planning based on power and wealth (Rubino et al., 2020). Powerful actors with political influence supported elephant conservation while impacts of the conflict were borne by the rural poor with little access to levers of decision-making. Similarly, local stakeholders involved in Brazilian jaguar (*Panthera onca*) conservation argued that the influence of more powerful outside groups and state actors led to the exclusion of local participation in the programme's execution (Bredin et al., 2018). When institutions do not allow for meaningful participation, even indirectly through power- and knowledge-sharing, the legitimacy of wildlife managing institutions is often cast into doubt, and the potential management programmes failure and human–wildlife conflict escalation may lead to retaliation against wildlife (Clark, 2009; Manfredo et al., 2017; Mech, 2017; Morzillo et al., 2010; Paloniemi et al., 2015; Serenari & Peterson, 2016).

Differential access to data, knowledge and education are also common sources of participatory injustice, facilitating greater participation by wealthier groups in urban wildlife management. Rising concerns over recovering coyote populations in San Francisco, California serve as an illustrative case (Taylor, 2020). A recent analysis of the SF Animal Care and Control (SFACC) database revealed that reports of coyote conflict and hazing—the active deterrence of coyotes—occur more often in wealthier, less vulnerable neighbourhoods (Wilkinson et al., 2023). While the ‘luxury effect’ (see Pathway 3) explains why coyotes may be more populous in these wealthier neighbourhoods, wealthier residents may also have greater access to the SFACC database, leading to more responsive management in these neighbourhoods. The correlation between hazing and income is noteworthy, considering ‘people were more likely to express that coyotes are becoming bolder or unusually more numerous in locations of higher housing density, pollution burden, and population vulnerability’ (p. 13). Research in both urban and rural areas suggest that wealthier residents have often been the recipients of more intensive public education efforts on coexisting with coyotes, which underscore the value of hazing (Figure 3; Coexisting with Urban Coyotes, 2020; Wildlife Encounter Tips, 2018). In San Francisco, these public education efforts tend to occur within the city's public and National parks, which have historically excluded marginalized communities living in the Bay Area (Roberts & Chitewere, 2011). Palamar et al. (2013) offer further evidence for this, showing in

Greensboro, North Carolina that Latinx and Black residents had received less education about animal bites, rabies transmission and rabies prevention (Palamar et al., 2013).

Relatedly, knowledge of and access to venues for participation are often stratified by wealth and marginalization. For example, urban rat abatement programmes are demonstrably less effective among marginalized communities where awareness of, trust in, and engagement with managing institutions are already low (Lee et al., 2021). When decision-makers prioritize public participation in wildlife management and emphasize multi-level institutions, injustices resulting from wildlife ecology and management diminish (Jackson & Wangchuk, 2001; Sandström et al., 2009). For example, property damage inflicted by black bears (*Ursus americanus*) is a major concern in Aspen, Colorado (Don Carlos et al., 2009). Aspen, a well-known resort town with a large population of second homeowners, has been described as ‘supergentrified’ due to existing norms of exclusion and self-interested economic protection (Stuber & Paulsen, 2022). Given the wealth inequality present in Aspen and other mountainous tourist towns across the United States, research is needed to evaluate whether conflict with black bears is shouldered by homeowners or renters in lower socioeconomic neighbourhoods, as well as whether people living in lower socioeconomic brackets have fewer opportunities to attend educational seminars about how to prevent black bear conflict and/or partake in participatory decision-making about black bears. In the same way that research has demonstrated that some people do not vote because they cannot get time off work (Dyck & Gimpel, 2005), people who work flexible or remote jobs have more access to wildlife coexistence workshops and public meetings held during weekdays or work hours, whereas those from lower socioeconomic classes may struggle to attend. In other words, ‘collaborative governance’ approaches may be particularly effective in urban wildlife management by including diverse citizens at multiple levels of institutional process (Carter et al., 2021; Redpath et al., 2017). Recent research in other fields has helped identify methods for and trade-offs in deploying participatory governance approaches, and these can help inform urban wildlife management strategies that increase effective participation (Reed, 2008; Reed et al., 2018). Future research can further examine the opportunities for and impact of educational interventions or collaborative governance schemes in improving the equitability of wildlife benefits and impacts (Connolly & Nelson, 2023).

2.3 | Pathway 3: Spatial patterns of urban inequity

The emergence of injustice from broader social structures and histories is a chief concern of *critical environmental justice*, which has documented how state activities at multiple scales render groups across a range of categories of difference as ‘dispensable’ (Pellow, 2016, 2017). These forms of injustice are often apparent in the patterning of space—including residential, infrastructural, green and business spaces. The layout of urban space is an important structural force in



FIGURE 3 Coyotes in California exemplify multiple intersecting pathways between people, wildlife and environmental justice. Pathway 2: Wildlife Management and Decision-making—A sign educating visitors about coyotes in the exurban Marin Headlands, Golden Gate National Recreation Area, CA. Avenues for learning about coyotes and how to interact with them may be stratified by income, since public green spaces are not uniformly accessible (Photo credit: Gabi Dunn). Pathway 4: Wildlife and Health—Inequitable levels of access to municipal services across a city can result in concentrations of trash and rodents, which attract coyotes to dense urban areas and create human–wildlife conflict. Photo credit: Michael Francis. Pathway 5: Psychological and emotional well-being—Seeing a coyote can be an emotional and symbolic experience. The return of coyotes to urban areas excites some residents, especially those who have shouldered an ‘extinction of experience’ when it comes to being able to share their neighbourhoods with wildlife. However, those that get to enjoy these benefits often reside in wealthier neighbourhoods. Photo credit: Eric J. Smith. Pathway 6: Racialized Discourses—Residents of Torrance, CA used loaded terms typically reserved for human residents to successfully advocate for coyote culling within the city of Torrance. However, persecuted wildlife can also be used as symbols of power within anti-racism advocacy. For example, the Los Angeles Black Coyote Collective ‘works to assist marginalized and working class communities’ and is heralded by a coyote. Photo credit: Axel Koester.

urban geography driving patterns of human residence and wildlife ecology and can lead both directly and indirectly to concerns identified by distributive, participatory and critical environmental justice scholarship (Basak et al., 2022; Byrne et al., 2009; Metzger, 2016; Soulsbury & White, 2015; Wolch et al., 2014). Access to many important ecosystem services detailed in pathway 1 is mediated by spatial patterns, with strong implications for environmental justice (Baró et al., 2019, 2021; Nazmul Haque & Sharifi, 2024). Here we discuss these spatial patterns and their consequences for wildlife-related injustices. However, it is important to note that such patterns can indirectly influence the other pathways described in this review.

Research in urban planning has, for many years, acknowledged that most cities are stratified geographically by wealth (Florida & Mellander, 2016; Glaeser et al., 2009; Massey et al., 2003; Nijman & Wei, 2020; Speier, 1936). Both designated green spaces and tree

canopies are typically denser in wealthy areas, often due to long histories and ongoing policies designed to maintain racial and class segregation (Clarke et al., 2013; Hope et al., 2003; Langhans et al., 2023; Schwarz et al., 2015). These patterns are not ecologically inert; they determine which wildlife species can occupy which parts of the city (Schell et al., 2020).

In many cities, wealth stratification also results in wildlife stratification. Those urban animals causing fewer negative impacts and whose presence is preferred by people, such as songbirds, often occur more frequently in wealthier neighbourhoods (Fidino et al., 2022; Perry et al., 2020). As another example, private wildlife gardens have become increasingly popular over the last decade as property owners seek to attract preferred wildlife species, such as native birds and pollinators. Such gardens can have positive ecological impacts in urban spaces; however, these benefits are typically

concentrated in areas occupied by wealthier homeowners (Curtin & Fox, 2014; Larson et al., 2022). Public wildlife gardens and wildlife-oriented urban green spaces that might benefit more diverse urban constituents are rare, but these spaces offer a promising avenue for urban planners and wildlife managers to improve equity through urban design (Mumaw et al., 2017; Mumaw & Bekessy, 2017; Soga et al., 2014a, 2014b). When particular animals are not preferred in wealthy neighbourhoods, wildlife managers often respond quickly to resident demands, as described in Section 2.2 above (Hunold, 2020; Hunold & Lloro, 2022).

Meanwhile, as a result of public policy decision-making, the presence of urban animals that cause more severe negative impacts and are not preferred by people, such as rodents and mosquitoes, often occurs more frequently in low-wealth neighbourhoods. For example, in Baltimore, Maryland, Biehler et al. (2018) documented city authorities' racist housing and planning policies that led to systemic disinvestment in marginalized communities in the city. Ultimately these social and economic patterns drove ecological change, resulting in mosquito infestations and associated ecosystem disservices, like poor medical and psychological consequences, for these communities. In other cities, histories of urban wildlife extermination have ensured that only highly adaptable species can survive, forming undesirable species assemblages that create damage and evoke disgust, especially for low-wealth communities of colour (Lerman et al., 2020).

While few studies have considered whether the ecosystem services that wildlife directly provide to cities are inequitably distributed, conversely, a large body of literature has examined the 'luxury effect' on urban biodiversity and green space. Describing the positive correlation between social and economic affluence and biodiversity, the 'luxury effect' is highly pronounced in cities where patterns of urban land use bifurcate wildlife experiences: more affluent urban residents typically have wildlife experiences that yield benefits, while less affluent residents are more likely to have negative encounters (Estien et al., 2024; Perry et al., 2020). In general, wildlife diversity increases in cities with affluence, a pattern that holds true in multiple geographies and for multiple taxa, including birds (Chamberlain et al., 2019; Lopez et al., 2020), herptiles (Ackley et al., 2015; Gledhill & James, 2012; Smallbone et al., 2011) and mammals (Magle et al., 2016, 2021). Leong et al. (2018) described how higher socioeconomic status is often correlated with higher biodiversity, including in the distribution of bird, bat, lizard and arthropod species (Leong et al., 2018). Villaseñor and Escobar (2022), meanwhile, found that a keystone hummingbird species occurred more often in neighbourhoods with higher socioeconomic status (Villaseñor & Escobar, 2022). Other studies have shown that the benefits of urban bird diversity are economically significant—approximately 120 million USD/year in Seattle, USA, and 70 million USD/year in Berlin, Germany—with growing evidence that bird diversity increases the market value of housing (Farmer et al., 2013). In a case study in Ethiopia, Perry et al. (2022) showed that urban neighbourhoods that attract higher wildlife diversity improve human health outcomes, enhance 'livability', and increase real estate values

(Perry et al., 2022). These studies mirror recent research on gentrification and ecosystem services (Amorim Maia et al., 2020; Baró et al., 2021; Łaskiewicz & Sikorska, 2020) and suggest that urban wildlife further amplify the luxury effect, improving urban quality of life primarily for affluent city dwellers. Other studies have also demonstrated the relative lack of green space access within lower-income communities, even though these studies did not centre their analyses on the role of wildlife (Agyeman, 1990; Byrne et al., 2009; De Sousa Silva et al., 2018; Nay et al., 2022).

When cities are considered parts of larger regional and global economic networks, human–wildlife relationships and resulting injustices become even more complex. International wildlife trafficking between urban hubs, for example, not only hastens species declines, but creates violent conditions that disproportionately impact the rural poor and Global South communities (Aceves-Bueno et al., 2021; Arroyo & Wyatt, 2019; Kelly, 2018). Few examples are starker than the COVID-19 pandemic, which originated in an urban wildlife market and led to globally devastating and highly inequitable health and economic impacts.

Differential exposure to wildlife through urban planning and geography thus reinforces existing patterns of inequity. A number of key concerns in urban planning, which have been found to lead to unjust spatial patterning in other contexts, merit further research regarding their connections to wildlife management and justice. Green space has a clear connection to urban wildlife, but less obvious topics like growth boundaries, zoning and housing density, and transportation planning all can directly and indirectly alter spatial patterns of urban ecology with ramifying consequences for justice. Topics such as these are not currently represented at the triple intersection of wildlife, justice and cities and should be priorities for future research.

What is more, this stratification reinforces the problematic notion that wildlife are inherently 'good' or 'bad' (Perry et al., 2020). Wildlife are frequently blamed and managed as singular, proximate causes of impacts (Jerolmack, 2008), when such effects result from broader social structural processes. Urban planning and design that works towards fostering human–wildlife coexistence, rather than simply categorizing good and bad wildlife can make cities more than just dwelling-and-work spaces for people (Apfelbeck et al., 2020; Hunold & Mazuchowski, 2020).

2.4 | Pathway 4: Wildlife and health

Distributive justice is concerned with more than strictly economic effects; human health, in particular, is a particularly significant ecosystem service when it comes to environmental justice (Abara et al., 2012; Everard, 2021; Few, 2013; Jennings & Gaither, 2015). An emphasis on the connections between wildlife and human health is relatively new to urban ecology (Bradley & Altizer, 2007; Collins et al., 2021; Ellwanger et al., 2022; Lindahl & Magnusson, 2020; Murray et al., 2022). The concept of 'One Health', which links environmental, wildlife and human health, has begun to rise to the

fore in strengthening these connections (Cunningham et al., 2017). In a recent review, Murray et al. (2022) stressed the importance of human–wildlife relationships in cities, calling for the consideration of a One Health framework to make cities more just and equitable for both people and wildlife. Here we discuss a range of issues in which wildlife–health relationships can produce ecosystem services and disservices and resultant environmental justice concerns.

Wildlife ‘pests’ play a particularly important and complex role in human health outcomes. Animals defined as ‘pests’ and the subsequent management strategies of ‘elimination/extermination’ are a common part of life in urban areas, and both have a direct effect on human health. The idea of a true ‘pest’ animal is intricately linked with the development of cities (Biehler, 2015). However, what is categorized as a pest varies by historical and geographical location and is influenced by individual perceptions and social/cultural values (Hadidian, 2015; Jerolmack, 2008). Typically, people have identified species such as flies, mosquitoes, bedbugs, rats and roaches as pests, though other larger fauna (e.g. racoons, bats, foxes, opossums) have also been referred to as pests depending on their location. However, the presence of pests and the actions necessary for pest management can create unequal harms for urban residents. Marginalized communities, for example, are often more negatively impacted due to exposure to zoonotic diseases, pesticides and rodenticide use (Ayrat et al., 2015; Murray et al., 2021; Rothenburger et al., 2017).

Pest prevalence is impacted by a number of environmental factors. For example, urban planners and elected officials frequently do *not* prioritize developing and maintaining greenspaces in lower socioeconomic neighbourhoods where marginalized communities often live, as discussed in Section 2.3 above (Langhans et al., 2023; Nay et al., 2022; Wilson, 2009). Even when greenspaces are present, they may receive little investment or upkeep from city institutions. In addition, the management of dedicated greenspaces can be compromised by such issues as limited municipal funds to hire arborists or maintain plantings. Meanwhile, human-generated trash and unmanaged vegetation provide shelter and breeding grounds for pests such as rats and mosquitoes, and trash-hauling companies have been documented dumping waste in abandoned lots in low-income neighbourhoods, providing food for rats and standing water for breeding mosquitoes (Biehler et al., 2018).

These common practices by public officials and corporate leaders contribute to the fact that marginalized communities are often more exposed to pests (Schell et al., 2020; Wilson, 2009), which can cause or amplify detrimental health effects (Estien et al., 2024). For example, insect pest prevalence has repeatedly been shown to be highest in areas characterized by low-wealth and high urban intensity. Bedbugs (Sutherland et al., 2020), mosquitoes (LaDeau et al., 2013) and roaches (Rivault et al., 1993) all exhibit similar spatial patterns in multiple cities across the world. Mammal pest species, such as mice and rats—including the diseases they may carry—have also been documented at higher rates in low-wealth neighbourhoods (Ayrat et al., 2015; Murray et al., 2021; Rothenburger et al., 2017). One study found individuals in a disadvantaged neighbourhood in Vancouver, Canada faced physical and mental health consequences

from exposure to rats (Byers et al., 2019). Communities with high levels of pests may be more exposed to bad odour and harmful bacteria, which can lead to higher rates of illness and exacerbate pre-existing health conditions. The presence of cockroaches can increase or lead to higher rates in the development of asthma, since their saliva, faeces and shed body parts function as allergens that can constrict airways in the lungs, particularly for children (Byrd & Joad, 2006). As exposure to pests increases, so too does the likelihood of those pests’ transmitting pathogens to humans (De Sadeleer & Godfroid, 2020), so people in more disadvantaged neighbourhoods are often the ones who are first exposed to these diseases. For example, the West Nile virus occurrence in Atlanta, Georgia can be correlated with the location of low-wealth households, older houses and housing density (Lockaby et al., 2016). Additionally, there have been higher reported levels of tick-borne diseases within communities of colour in urban environments, which can lead to higher rates of Lyme disease (Halsey et al., 2023).

This increase in pest exposure for marginalized communities in typically lower-wealth neighbourhoods reflects historical precedents of governmental neglect and a systemic lack of resources, such as housing policies that failed to enforce landlord accountability in marginalized neighbourhoods. It would be incorrect to assume that residents have neither the knowledge of nor interest in addressing the issue. Due to long-standing residential segregation, landlords have been able to neglect buildings rented to predominantly lower-wealth Black communities and other marginalized groups with few legal repercussions (Biehler, 2015). Some politicians have echoed broader systemic prejudices by promoting the false narrative that pests were common in poorer areas (usually populated by people of colour, Indigenous and immigrant communities) because they were ‘unclean’ or ‘dirty’ environments—and made so by the individuals that lived in them (Alagona, 2022). In addition, there is often an inherent sense of shame from infestations, especially in communities that have been unfairly labelled ‘dirty’. And as a result, some people will try to hide such infestations, which usually leads to an increase in the prevalence of pests like bed bugs (Asshoff et al., 2022; Sheppard et al., 2022).

Despite intentions of providing healthier living conditions, many government-led urban reform projects fall short due to systemic inefficiencies and insufficient resource allocation (Angelo & Vormann, 2018; Biehler, 2015). Indeed, responses to pests in U.S. cities are often framed as a ‘private’ responsibility of the residents. But marginalized populations were often historically forced into less desirable neighbourhoods (see Pathway 3, above) with underlying factors that encourage and exacerbate pest infestations, making it much more difficult to address pest presence (Biehler, 2015; Rauh et al., 2008; Swope & Hernández, 2019). And while pest quantities and exposure to pests are often higher in predominantly marginalized neighbourhoods, the pest management response can be equally problematic. This disproportionate effect on people of colour, Indigenous and low-wealth communities has even been called ‘agro-environmental racism’ (Williams, 2018). Pest control in urban neighbourhoods rarely takes into account historical environmental

injustices, such as systematic racism (Biehler et al., 2018). For example, pest control can be very expensive and time consuming on an individual scale. Thus, effectively dealing with pests requires public engagement and trust, which is usually lower for marginalized communities (Lee et al., 2021).

One of the most common forms of addressing pest infestations is through the use of pesticides or rodenticides. However, these treatments can have their own unintended consequences, like the evolution of resistance over time (Schell et al., 2020). Also, if systematic and substantial social structural concerns are not addressed (e.g. underfunded housing reform programmes, racial segregation and underlying biases) then removing one particular pest is only a temporary solution until another pest takes its place (Biehler, 2015). Vulnerable communities thus often experience a sense of 'doomed if you do, doomed if you don't' when it comes to pests and pest control. Communities with large quantities of pests are often forced to decide between the health hazards associated with the pests and the health hazards associated with the higher quantities of pesticides needed to address the infestation. Pesticides can be hazardous, particularly for fetuses and children (Garry, 2004; Landrigan et al., 1999; Matysiak et al., 2016). In addition, pesticides can also be very costly to implement, and individuals who attempt their own pest control often face health issues such as poisoning or chemical burns (Biehler, 2015; Damalas & Koutroubas, 2016). These are serious concerns for neighbourhoods occupied by people of colour, Indigenous and low-wealth communities that are already overburdened with industrial chemical risks, health disparities and other environmental injustices.

On a broader scale, pesticides often affect these neighbourhoods from production to utilization to disposal (Donley et al., 2022). Pesticide manufacturing facilities, for instance, are often built nearer to vulnerable populations or the only available housing for lower-income individuals is closer to the sites of former manufacturing locales—a classic illustration of environmental racism. Additionally, these vulnerable communities are often not provided adequate education or training about pesticides, and there is often little follow-up after the deployment of pesticides (Donley et al., 2022). Pesticides also have the unintended consequence of harming other animal species, notably predator species who help remove pests (e.g. bobcats, raptor species) (Berny et al., 1997; Fournier-Chambrillon et al., 2004; Riley et al., 2007). This further impacts the ability of people in impacted communities to have positive interactions with larger, more charismatic animal species (Schell et al., 2020).

Increasingly, cities are becoming concerned about the ethics of the pest removal industry (Hadidian, 2015). Many are shifting to a coexistence approach rather than conflict models of engagement. As such, rodenticides are being banned in many places—not for the sake of the rats, but for the sake of the larger predators that prey on them (Hunold & Mazuchowski, 2020). However, this tactical shift can unequally affect neighbourhoods with higher rodent densities. Given all these factors, the effects of pests and pesticides are often unequally felt by marginalized communities due to a variety of social,

economic and political factors, and they are often forced to make difficult decisions in attempts to mitigate the health effects of both pests and pesticides as much as possible.

2.5 | Pathway 5: Psychological and emotional well-being

Human emotional well-being is an important new frontier in studies of the environment. Literature focusing on cultural ecosystem services has called for clearer connections between the environment, psychological well-being and environmental justice (Agarwala et al., 2014; Bratman et al., 2019; Chan & Satterfield, 2016; Kosanic & Petzold, 2020; Summers et al., 2012), and an emerging literature on *affective environmental justice* describes the importance and the complexity of addressing these concerns (Kojola & Pellow, 2021; McInturff et al., 2021). People who live through climate change-related events such as extreme weather, poor air quality and rising temperatures can experience increased symptoms of depression, anxiety, post-traumatic stress disorder (PTSD) (Clayton, 2021), grief, major depressive disorder (German & Latkin, 2016), substance misuse, survivor guilt and recovery fatigue (Cunsolo Willox et al., 2015; Hayes et al., 2018). A number of new concepts have come into usage to reflect the range of consequences on individual and collective mental health, including ecoanxiety, eco-guilt, ecopsychology, ecological grief, solastalgia, biospheric concern and eco-angst. These phrases have been grouped under the broader category of 'psycho-terratic', a term meant to capture the emotions associated with the increasingly negative relationship humans have with our home environments and their destruction (Albrecht, 2019). And while these emergent concepts are significant, few have been applied to the experiences of populations marginalized by structural inequalities, institutional racism and state violence.

Foundational efforts have been made to document the psychological impacts of pollution on communities of colour (Bullard, 2008), as well as the affective and embodied sense of grief, anger, shame and hopelessness that Indigenous communities can feel in response to environmental decline (Norgaard & Reed, 2017), foregrounding the importance of incorporating *recognition justice* into an understanding of psychological and emotional impacts, which may vary across worldviews and ontologies (Martin et al., 2014; Norgaard & Reed, 2017). The loss or absence of wildlife in particular can lead to the absence of a crucial ecosystem service, but it can also be a source of trauma for communities who view cultural keystone species as their relatives and as intrinsic to their sense of place (Martinez et al., 2023; Norgaard & Reed, 2017). This is especially true for groups that have been subjected to the psychological violence associated with systems of settler colonialism and racial capitalism (Kojola & Pellow, 2021). Both of these systems are founded on social and ecological domination and are responsible for the extirpation of many culturally significant species from the contiguous United States and in other regions of the world via deliberate government-sponsored eradication campaigns (Feldman, 2007). The emotional

loss that marginalized communities may feel in response to wildlife absence can be indicative of an *affective environmental justice* issue (McInturff et al., 2021), which describes emotions as a form of environmental harm.

Given that a central tenet of environmental justice and many Indigenous cosmologies is that humans are inherently part of nature and that nature is inseparable from anthropogenic spaces (Mohai et al., 2009), it is significant that the emotional impacts of wildlife presence or absence within urban contexts is largely unexplored. Multiple studies have documented the psychological benefits of being proximal to nature in urban settings (Mumaw et al., 2017; Shanahan et al., 2015), and songbirds in particular have been studied as providing cultural ecosystem services (Belaire et al., 2015; Cox et al., 2018; Echeverri et al., 2020). Cameron et al. (2020) found a strong correlation between people's happiness and both the real and perceived biodiversity of the urban spaces they were in (Cameron et al., 2020). The authors suggest this correlation may be explained by the increasing importance of natural landscapes to urban citizens who now view biodiverse ecosystems as 'the "other" rather than the "norm"' (Cameron et al., 2020). This suggestion underscores how the emotional benefits of being proximal to wildlife may become a positively reinforcing cycle as urban citizens place increasing value on wildlife encounters and feel an increasing sense of loss over wildlife absence.

But as our section on the *luxury effect* demonstrates (Pathway 3, above), the emotional benefits of being proximal to wildlife are often not uniformly accessible across a city. For example, positive emotions linked with biodiversity were more likely to be reported in areas closer to the city edge than in areas in the centre of the city that had more anthropogenic noise and influence (Cameron et al., 2020). Scholarly literature on wildlife gardening has also demonstrated the psychological benefits of sharing space with wildlife, a significant cultural ecosystem service, but these benefits accrue primarily within neighbourhoods with more wealth and higher percentages of white residents (Curtin & Fox, 2014; Larson et al., 2022). Murray et al. (2022) describe low-wealth urban communities as shouldering an *extinction of experience* burden, which refers to the scarcity of opportunities these communities have to interact with nature. They frame the consequences of this extinction through the lens of physical and mental health, but, given the sense of intergenerational grief and loss that can accompany modes of settler colonialism, it is possible that this extinction is also felt as a deeply emotional, symbolic or spiritual loss. Scholars would also do well to examine and tease out the complex interrelations among climate change, human mental health and wildlife, particularly in urban areas. For example, we know that climate change negatively impacts both human mental health and wildlife habitat, but we know little about how wildlife's migration into cities might have a moderating effect on climate change's otherwise deleterious consequences for mental health.

Alternatively, living in proximity to wildlife can evoke feelings of fear, disgust or anger that are sometimes distinct ecosystem disservices from the economic impacts of wildlife presence. These emotional burdens can serve as examples of 'coexistence inequalities', a

term that has traditionally been used to demonstrate how the costs and benefits of living with wildlife are often unequally distributed between the Global North and Global South (Jordan et al., 2020) or between urban and rural communities (Zscheischler & Friedrich, 2022). Mayberry (2015) depicted the emotional burdens of living in proximity to elephants in rural Botswana, arguing that the visible impacts of elephants on human well-being such as property damage or human fatality are better documented in the literature than the hidden impacts such as stress and emotional strain (Mayberry, 2015). They go on to explain how the burden of fear can prevent people from enacting their daily routine, particularly individuals from vulnerable populations, like an elderly and disabled female participant in the study who was reluctant to fetch water out of fear of elephant attack. These negative emotions are a hidden impact of human-wildlife conflict that can have effects that outlast the immediate and 'visible' threats posed by wildlife, and they disproportionately manifest in low-income countries (Barua et al., 2013; DeMotts & Hoon, 2012).

While this evidence supports the role that emotions play in coexistence inequalities between the Global North and South, it is unclear how emotional coexistence inequalities manifest within more localized urban contexts. For example, what are the psychological and mental health consequences of living with urban pests? German and Latkin (2016) documented an association between increased depressive symptoms and higher rat prevalence in Baltimore, Maryland (German & Latkin, 2016). Murray et al. (2021) documented the mental health impacts of living with increased rat populations during the COVID-19 pandemic, including feelings of frustration, disgust and fear, and also found that lower-wealth neighbourhoods were more likely to assume 'the responsibility and cost of rodent control themselves rather than rely on neighbors or the city' than higher income neighbourhoods (Murray et al., 2021, p. 12). Killing animals can come with psychological and emotional challenges (Dillard, 2008), and it is unclear how these consequences emerge in response to pest eradication in marginalized communities. Crowley et al. (2018) examined the emotional impacts on conservationists and others in the United Kingdom who kill grey squirrels, an invasive 'pest' species, to protect native European red squirrels and steward broadleaf forests (Crowley et al., 2018). The discomfort and regret associated with killing grey squirrels often resulted in moral dilemmas for those involved in squirrel management. More research on the affective impacts of living with and/or killing pests in urban contexts is needed to understand if and how marginalized communities disproportionately share this burden.

2.6 | Pathway 6: Racialized discourses

Recent scholarship in *critical environmental justice* has stressed the importance of understanding overlapping logics, discourses and structures that create injustices for both people and wildlife (Pellow, 2016, 2017). In cities, increasing evidence suggests that there are shared logics that link the oppression of marginalized

human groups and violence towards animals (Cannon et al., 2023). In the same way that systems of settler colonialism and racial capitalism have historically hinged on both social and ecological domination (Kojola & Pellow, 2021), the effects of these systems can manifest in synonymous ways between humans and wildlife, particularly in urban settings. One way to detect the manifestation of these shared logics of oppression is via racialized and racist discourses of wildlife, which often involves likening unwanted wildlife species to particular human communities, or vice versa (Warda et al., 2022). Community-focused apps and forums like NextDoor or Facebook Groups can serve as platforms where racist and demeaning language is perpetuated (e.g. the comparison of coyotes (*Canis latrans*) or wolves (*Canis lupus*) to gang members (Whitley et al., 2023) or vice versa), and these sentiments can be indicative of a slew of environmental justice challenges that may be evident within a community, including issues of *recognitional injustice*, wherein relationships with animals are part of broader patterns of exclusion and marginalization (McInturff et al., 2021). These racialized and racist discourses, perpetuated through systemic cultural and institutional biases, have historically been used to disenfranchise humans, and the way that this rhetoric is either purposely or ignorantly replicated in urban spaces can promote violence against both people and wildlife (Arnds, 2020).

Racialized and racist discourses of wildlife have a long legal history. Settler America and England relied on linked policies of violence against both Indigenous peoples and wolves to uphold colonial power (Arnds, 2020). This overlapping rhetoric continues to be used today to simultaneously promote anti-immigrant and anti-wolf public policy positions (Nors, 2018; Zscheischler & Friedrich, 2022). Other examples include the historical construction of Black men in the United States as 'predators' (Brown, 2018), the animalization of Black Lives Matter protestors (Pellow, 2016; Warda et al., 2022), or comparisons of immigrants to invasive species (Coates, 2007; Subramaniam, 2001). Agyeman (1990) cited instances of 'invasive' animals and immigrants being contrasted to 'clean, tidy and hard-working' native animals and non-immigrants as an explanation for why Black people are often alienized and othered in rural places (Agyeman, 1990, p. 233).

Racialized discourses can stem from the long-standing notion that while there is a division between culture (humans) and nature (non-humans), cultural membership is not equally afforded to all humans (Fitzgerald & Pellow, 2014). The assumptions that are written into the culture-nature binary often inherently prioritize the powerful over the less powerful and are laden with language that blends animality and racialization (Anderson, 2000). In other words, the qualities that are often cited to separate humans from animals have also been used to separate people based on gender, class and race. Adherents to a culture-nature binary have often identified marginalized people with nature, and in so doing ascribed them lesser value within the dominant culture.

The racialized and racist discourse of people and animals can sometimes manifest in subtle and latent ways, but over time this language creates insidious narratives and solidifies cultural links

between whose rights are upheld in law and whose are not. Santa Ana (1999) catalogued metaphors used in *Los Angeles Times* articles focused on immigration in the United States and found that metaphors were most frequently used to equate immigrants to animals. Santa Ana defined animal metaphors as any metaphor that was grounded in biological determinism—a concept that originated with Aristotle's hierarchical *Great Chain of Being*. Further, they documented that both pro-immigrant and anti-immigrant articles used these metaphors. When comparing the use of animal metaphors in general to other subjects, such as business or sports, Santa Ana still found that animal metaphors were disproportionately present in articles about immigration.

This likening of citizens to humans, and non-citizens or criminals to animals, has a long history within criminalization and policing as well. Criminals have been compared to 'wild beasts' and 'wolves' since at least the thirteenth century (Pollock & Maitland, 2012), and extensive work has demonstrated how enslaved people in the 1800s and incarcerated people in the modern age have been othered and animalized in racialized and racist ways because of the notion that they stand outside of civil life and law (Dayan, 2011). In *The Law Is a White Dog*, Dayan documents numerous instances where more empathy and legal rights were granted to domestic dogs than to former and current convicts. The figure of the K9 dog or its teeth is a symbol and a technology of police terror and has long been equated with the instruments of law (Wall, 2016). In his work on the role that police dogs have played both metaphorically and literally in organized violence against Black communities, Wall explains how highly obedient police dogs are lauded as exemplars of professionalism, who can become 'family pets' when around white women and children but who will 'hunt' criminals as if they are 'beasts' or 'prey'. Wall cites songs, imagery and media instances to demonstrate how police dogs haunt Black urban life both in language and in action, since injuries resulting from police dog bites most frequently occur in less affluent areas with populations primarily comprised of Indigenous communities and people of colour (Wall, 2014). If the police dog, and by extension the police, are framed as domesticated hunters who 'pursue' and 'tame unruly beasts', and if criminals are 'beasts' who 'depredate' citizens, then such language transforms urban spaces into 'hunting grounds'. Here, police hunt people, whom they view as not just less-than-human but, in fact, less-than-dog.

Documenting instances of racialized and racist discourses of wildlife within urban spaces can perhaps be used to flag areas of potential social and ecological violence. For people living in urban areas, these discourses can manifest in physical police violence or in psychological violence through ostracization and dehumanization. For urban wildlife, these discourses serve as feedbacks that reinforce the undesirability of that animal's presence, thus instigating further human-wildlife conflict. Human-wildlife conflict is an inherently value-driven field, and instances of conflict with animals only occur when people define it as conflict (Marchini, 2014). Empirical studies examining the correlation between racialized and racist discourses of wildlife and instances of urban wildlife conflict may reveal

if and how the occurrence of one of these elements can be used to predict the occurrence of the other.

When seeking to conduct studies that could be used to reveal what links exist between social and ecological violence, it will be important to use these findings to simultaneously address both human and animal injustice. Sometimes racialized and racist discourses of wildlife can be co-opted and reinforced by groups that seek to exclusively elevate animal rights (Pellow, 2012). These groups may acknowledge that the existence of racialized and racist discourses stem from modes of coupled social-ecological domination but still only seek to 'elevate' animals from this dichotomy without combating human oppression. At the same time, as Fitzgerald and Pellow (2014) make clear, 'we cannot simply attempt to "elevate" certain human groups from the nature side of the dichotomy to the culture side. Instead, we must deconstruct the entire dichotomy' (p. 30).

3 | CONCLUSION

Wildlife are important residents of urban communities, which are always multispecies spaces. On a daily basis, they interact with—or seek to avoid—people living alongside them, and this complex cohabitation profoundly shapes the experience of urban life for all city dwellers across the species spectrum. Our review makes it clear that these impacts and benefits are inequitably distributed and often further disadvantage already vulnerable and marginalized groups. Governmental processes and institutions established to manage wildlife often deepen existing social inequities through uneven or unfair practices. The range of pathways between wildlife and injustice poses a challenge that demands future research, as many of the pathways we have described are complex, indirect or reciprocally connected with other pathways. However, by recognizing that urban wildlife ecology and management are also environmental justice concerns, this review poises researchers and managers to understand the links between ecology and justice and identifies gaps in current management regimes.

Our review found that limited research exists directly linking urban wildlife and environmental justice. Scholarship on rural areas offers helpful guides for future research, as do studies from urban areas on related topics, but it is difficult to transpose findings directly from one context to another. In particular, the cultures, institutions and economics that define rural societies are often distinct from urban areas, where institutions are typically more complex, human populations more diverse and ecosystems more novel. While some lessons can be drawn, the nexus of urban ecology, wildlife and justice demands more and targeted research. Birds and mammals are well represented in our review, and in urban ecology more generally (Collins et al., 2021), but many other urban wildlife species and their relationships with justice are poorly understood. Rural areas have received considerably more scholarly attention. In addition, much of the literature we found on urban

ecology and environmental justice related to wildlife came from North America. This produces a specific geographic slant within our current understanding, and itself presents an issue of justice, as overrepresentation of the global north is a pattern common in many bodies of literature. These findings point to the need for further case studies in diverse geographies, especially the Global South. More broadly, each of the pathways we identified can be better understood through focused research programmes and empirical case studies. Several of the pathways we have identified—like economics, decision-making, urban planning and health—have long been core concerns of environmental justice. Others—like psychological well-being and racialized discourses—would allow for urban ecology to connect with novel theorizing in environmental justice, especially around critical, recognitional and affective justice. These intersections offer rich ground for collaborative interdisciplinary research.

We have intentionally focused primarily on issues of *social* justice, rather than taking up multispecies justice concerns. However, the experiences of people and wildlife in cities are not independent (Cannon et al., 2023). Scholars have argued that understanding core concepts of contemporary urban ecology—like sustainability and gentrification—depends on viewing urban-ecological entanglements through a multispecies justice lens (Arcari et al., 2021; Fieuw et al., 2022; Hubbard & Brooks, 2021). Other scholars have made the case for animals' 'right to the city' and the opportunity for flourishing therein (Delon, 2021; Shingne, 2021; Shingne & Reese, 2022).

Healthy human and wildlife populations rely on one another. Much like humans, species like raccoons and coyotes suffer from illnesses like hyperglycaemia when they rely on processed human foods (Mozzon, 2020; Schulte-Hostedde et al., 2018). When wildlife cause economic damage, they are often killed or relocated (Stanger et al., 2022). The reciprocal connections between people and wildlife in cities further emphasize the need for a justice-oriented approach to management that can engage with growing research on multispecies justice in cities (Arcari et al., 2021; Celermajer et al., 2021; Fieuw et al., 2022; Hubbard & Brooks, 2021).

Throughout this essay, we have referenced studies that tend to characterize wildlife as 'good' or 'bad', and their effects on people as 'positive' or 'negative'. These dichotomies are helpful in understanding the range of pathways that link people, wildlife and justice. However, these binary categories also mask complex arrangements of geography, history and power. When wildlife impact or benefit people in a city, this is not a direct intention on the part of the species but a consequence of their ecology intersecting with the human social and built environments. Rather than focusing on 'good' or 'bad' wildlife, urban wildlife management could benefit from an environmental justice lens that recognizes both the direct impacts of wildlife as well as the structural context that enables those impacts.

The majority of humans now live in cities, and the Earth is projected to become increasingly urbanized in the coming decades (Seto et al., 2013). On a planet with several billion urban residents, the

effects of urban wildlife on people will become more and more central to both social justice and wildlife conservation. Aligning these concerns in urban and rural areas is paramount. Our review suggests that a just city will consider how people and wildlife can cohabitate cities as multispecies environments, will allow for more democratic participation in wildlife management and wildlife care, will foster wildlife education across diverse urban geographies, will promote and plan for greater and more inclusive human access to green space and beneficial wildlife encounters, and will address wildlife impacts alongside other serious threats in an equitable fashion. The pathways we have laid out here offer a starting point for navigating this terrain.

AUTHOR CONTRIBUTIONS

All authors contributed to project development, research design and literature review. Alex McInturff led the writing and revision of the manuscript, and Lara Volski and Megan M. Callahan contributed to writing. Alex McInturff, Lara Volski and Megan M. Callahan developed all figures. All authors contributed critically to tables, manuscript drafts and revisions and gave final approval for publication. Funding for publication was provided by the Mellon Sawyer Seminar on Energy Justice in Global Perspective.

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The authors declare no conflicts of interest.

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Our manuscript does not include data.

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