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RESEARCH ARTICLE

Addressing the challenge of wildlife conservation in urban landscapes by increasing human tolerance for wildlife

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Abstract

1. Urbanization is a key driver of global environmental change and is adversely impacting wildlife populations. Human tolerance for wildlife is critical to wildlife conservation in urban areas.
2. Using metropolitan Atlanta, Georgia, United States, as a case study, we investigated human tolerance for a range of different wildlife species. Almost half of the human–wildlife interactions that are reported to the state wildlife agency originate from metropolitan Atlanta, which is one of the fastest growing metropolises in the United States.
3. We surveyed a representative sample of 1006 residents of metropolitan Atlanta in 2022. We found heterogeneity in respondents' tolerance for various species, although most respondents were intolerant of bobcats, coyotes, opossums and snakes. Respondents' tolerance for different species largely depended on their attitudes and emotions towards species, and their basic beliefs pertaining to wildlife and the relationships between humans and wildlife. We found some evidence that tolerance also depended on people's prior interactions with wildlife, their beliefs that they can mitigate conflicts with wildlife and their demographic characteristics.
4. Our results suggest that communication that improves urban residents' attitudes towards wildlife and/or reinforces positive emotions towards wildlife may increase wildlife tolerance in urban areas.

KEYWORDS
attitudes, emotions, environmental justice, human–wildlife conflict, self-efficacy, urbanization

1 | INTRODUCTION

Urbanization is a key driver of global environmental change (Seto & Satterthwaite, 2010). In North America, almost 80% of the human population lives in urban areas (McCance et al., 2017). Urban expansion has transformed terrestrial ecosystems, thereby impacting biodiversity, native habitats, trophic dynamics, ecological processes and ecosystem services (Seto & Satterthwaite, 2010; Wu, 2014). As such, urban expansion has important implications for wildlife conservation. A subset of native wildlife species thrive in urban ecosystems, owing to decreased predation pressures and increased access to resources (e.g. anthropogenic food sources;

Fischer et al., 2015; McCance et al., 2017; Wu, 2014). Humans are experiencing more frequent interactions with urban wildlife (Frank et al., 2016; Soulsbury & White, 2015), including damage to people's backyards, threats to or attacks on people and their pets, and vehicle collisions (Schell et al., 2020). This presents a substantial wildlife management challenge because increased human–wildlife interactions occur within a larger framework of superficial public knowledge about wildlife, unrealistic public expectations about living with wildlife and issues of environmental justice (McCance et al., 2017; Sterba, 2012).

Humans have distinct spatial orderings pertaining to animals and the 'proper (physical) places' that animals should occupy (Philo & Wilbert, 2004). Abundant urban wildlife may be seen as nuisances, pests or threats to pets and human health and safety (McCance et al., 2017). However, people differ in their space-place boundaries for wildlife, and hence, their expectations for which wildlife should exist within urban ecosystems (McCance et al., 2017). The growing belief of urban residents that humans and wildlife should coexist has reduced public support for euthanization of conflict species (Manfredo et al., 2020), although people may still expect agencies to 'solve' human–wildlife conflicts by relocating conflict wildlife (an action that is often neither feasible nor effective). As part of their efforts to conserve and manage urban wildlife, wildlife agencies have used outreach and education to increase public knowledge of wildlife and change people's behaviours to mitigate human–wildlife conflicts. Ultimately, however, wildlife conservation in urban spaces depends on human tolerance for wildlife (Bruskotter & Wilson, 2014; Sage et al., 2022). Enhancing human tolerance for urban wildlife is important to ensure that urban ecosystems provide protection for native, rare and imperilled species and that urban residents derive social and cultural benefits from positive interactions with wildlife (Magle et al., 2012). Here, we investigate people's wildlife tolerance in metropolitan Atlanta, Georgia, United States, and drivers of wildlife tolerance.

Human tolerance for wildlife is a necessary precondition to wildlife presence and persistence in urban spaces (McCance et al., 2017) and determines the limits to wildlife distribution and densities (Aronson et al., 2017; Bruskotter & Wilson, 2014; Sage et al., 2022). Human tolerance for wildlife predicts people's behavioural intentions towards wildlife (e.g. reporting perceived or actual conflicts, trapping and euthanizing wildlife, and coexisting with wildlife; Bruskotter et al., 2015) and is critical to the success of wildlife conservation efforts (Frank et al., 2016). Wildlife intolerance manifests in increased claims on wildlife agencies' resources and time to address human–wildlife conflicts and makes it more politically challenging for agencies to manage wildlife (Bruskotter et al., 2015; McCance et al., 2017).

Prior research shows that wildlife tolerance depends on the taxonomic group with which people interact (Kansky et al., 2014) and people's (1) attitudes towards wildlife, (2) emotional response to wildlife, (3) beliefs pertaining to wildlife (i.e. wildlife value orientations), (4) prior interactions with wildlife, (5) ability to manage or avoid risks associated with wildlife (self-efficacy), (6) trust in the agency managing wildlife and (7) demographic characteristics such as gender, ethnicity, education and income (Bruskotter & Wilson, 2014; Dickman, 2010; Kansky et al., 2014, 2016; Slagle & Bruskotter, 2019). Attitudes are mental states and encompass people's evaluation of wildlife along a positive–negative continuum (e.g. dislike to like; Slagle & Bruskotter, 2019). People's affect or emotional disposition (i.e. their feelings, sensations and moods; Vaske et al., 2013) shape their perceptions of, and emotional responses (e.g. fear, joy and anger) to, wildlife (Jacobs et al., 2012). Wildlife value orientations are general patterns of basic beliefs pertaining to wildlife and the relationships between humans and wildlife (Jacobs et al., 2014). Studies show that two main wildlife value orientations have emerged in the public, namely 'domination' and 'mutualism' (Manfredo et al., 2009; Teel et al., 2010). Individuals with a domination value orientation believe wildlife should be managed for human benefit, tend to prioritize human well-being over wildlife and are more likely to consider actions that result in the death or harm of wildlife as acceptable (Jacobs et al., 2014). Individuals with a mutualism wildlife value orientation view wildlife as part of an extended family and deserving of rights and care, tend to anthropomorphize wildlife and engage in welfare-enhancing behaviours for individual wildlife (Jacobs et al., 2014). People with high levels of self-efficacy are more likely to tolerate wildlife because they believe that they have the information, skills, opportunities and other resources needed to manage human–wildlife conflicts (Bandura, 1977; Klöckner, 2013). Individuals who trust wildlife agencies to manage wildlife and human–wildlife conflicts tend to have lower risk perceptions pertaining to wildlife and are more likely to accept advice from wildlife agencies, thereby mitigating human–wildlife conflicts and increasing wildlife tolerance (Sakurai et al., 2013).

Although studies have shown that gender, age and education levels influence people's risk perceptions and wildlife tolerance (Kimmig et al., 2020; Wald & Jacobson, 2013), few studies have examined wildlife tolerance in urban Black and Hispanic communities (but see Van Velsor & Nilon, 2006). We predicted that race would influence wildlife tolerance in metropolitan Atlanta, which has a racially diverse population. We further predicted that people with mutualism value orientations, positive attitudes and emotions towards wildlife, higher self-efficacy and trust in the state wildlife agency would have higher tolerance for wildlife. Finally, we predicted that tolerance would vary according to wildlife species and that residents of metropolitan Atlanta would have lower tolerance for species with which they have had negative interactions (McCance et al., 2017). Our study responds to the call for more research on the understudied topics of human tolerance for urban wildlife, human–wildlife interactions in urban ecosystems and wildlife tolerance in minority communities (Magle et al., 2012; McCance et al., 2017; Schell et al., 2020). Importantly, our research team included both academic researchers and wildlife agency personnel, a pre-condition for generating knowledge that is actionable (Magle et al., 2012).

2 | METHODS

2.1 | Study area

Metropolitan Atlanta is one of the fastest growing metropolises in the United States (US), causing rapid urbanization of the 20 counties that are contained within the metropolitan area (Figure 1; Liu & Yang, 2015). Approximately 5.9 million people occupy nearly 6200 square miles (16,000 km^2; U.S. Census Bureau, 2020). Increased development (~34% of the land area) has resulted in forest loss and fragmentation (Lo & Yang, 2002; Miller, 2012), although 45% of the metropolitan area remains under forest cover. Owing to its tree cover, prevalence of green spaces, and proximity to several wilderness areas, residents of metropolitan Atlanta experience interactions with multiple wildlife species. For example, from January to June 2022, the Georgia Department of Natural Resources (GADNR) received 404 wildlife-related calls from Fulton County (the most developed and populous county in the region), including calls about white-tailed deer (*Odocoileus virginianus*; 23.3% of calls), coyotes (*Canis latrans*; 12.6%), raccoons (*Procyon lotor*; ~9%) and raptors (Falconiformes; ~9%). Of these, 44.8% of reports were complaints related to wildlife presence in the neighbourhood or yard, 33.4% were reports of sick, injured or orphaned animals, and the remaining reports pertained to threats to humans and/or domestic animals, property damage and other conflicts (GADNR Dashboard; https://www.arcgis.com/apps/dashboards/f093301a3122436082ccb1ff7ecbcaba).

With dramatic changes in the socio-economic and racial composition of the region, Atlanta has also experienced some of the largest increases in suburban poverty among major US metropolitan areas and high levels of residential segregation and gentrification (Cole & Immergluck, 2021; Lee, 2011; Strait & Gong, 2015). The largest racial groups are White (43.8%), Black or African American (hereafter, Black; 36.8%), Hispanic or Latino (hereafter, Hispanic; 11.6%), and Asian (6.8%). However, the spatial distribution of racial groups across metropolitan Atlanta is uneven. Racial inequalities have persisted due to historical practices such as segregation and redlining during the 19th and 20th centuries (Holman, 2016; U.S. Census Bureau, 2020), with historically Black neighbourhoods experiencing environmental injustice through unequal access to and distribution of quality green spaces (Dai, 2011; Roberts-Gregory & Hawthorne, 2016; Schell et al., 2020). Environmental injustice may also extend to the type and frequency of interactions with wildlife species, although to date this has not been studied in metropolitan Atlanta.

2.2 | Survey design

We designed an online questionnaire to be administered to residents of metropolitan Atlanta. In addition to asking respondents their gender, age, education level, income level and race/ethnicity, we collected information about the number of other people living in the household (including children), whether respondents owned pets, respondents' housing, how long they had lived in their current neighbourhood and whether respondents had gardens (including how gardens were landscaped). We tailored questions pertaining to interactions with urban wildlife, based on whether respondents

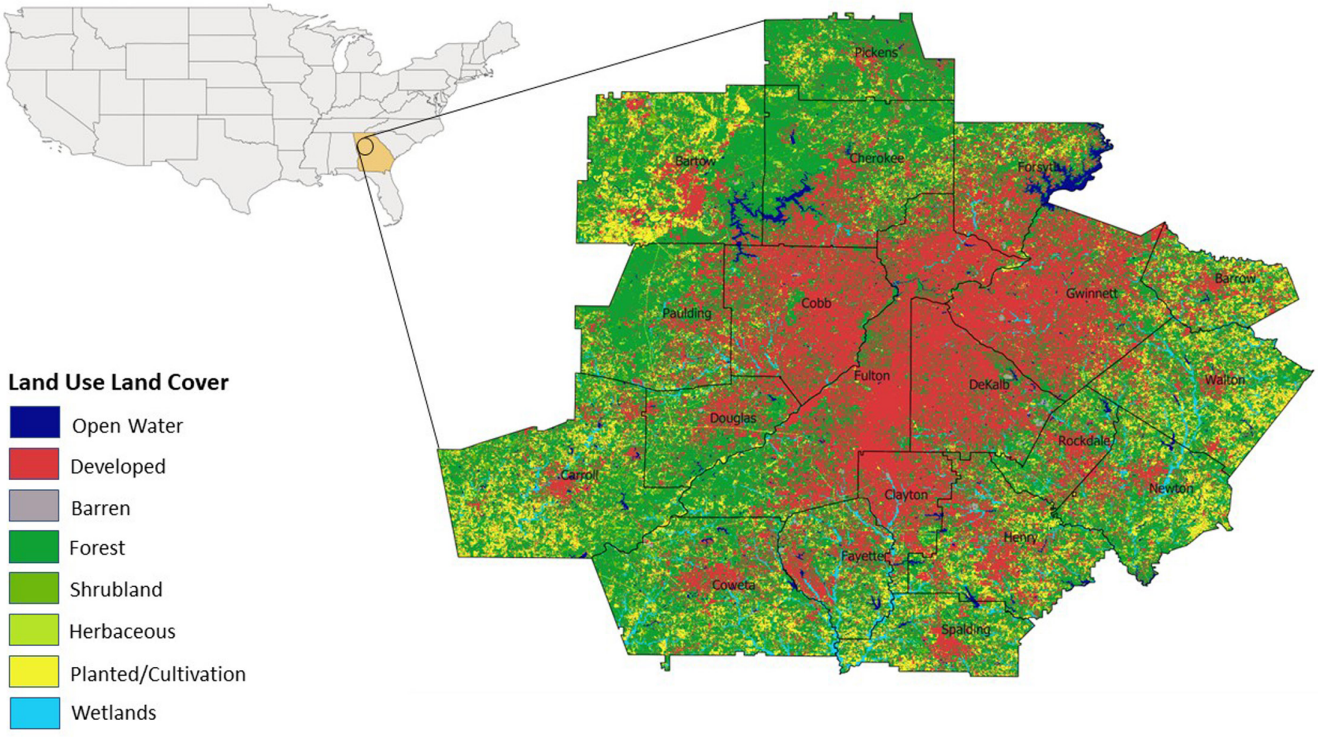

FIGURE 1 Land use map of metropolitan Atlanta showing the 20 counties included in our study area. Inset: location of study area in the State of Georgia. *Data source*: National Land Cover Database; https://www.mrlc.gov/.

lived with other household members, owned pets and had control over landscaping at their place of residence. We collected zip code information to determine the geographic location of respondents.

2.2.1 | Respondents' attitudes and emotions towards, and tolerance for, urban wildlife

We initially asked survey respondents to indicate, based on their or neighbours' sightings, which of 15 species or taxa (hereafter, 'species') are in their neighbourhood, namely: bats (*Chiroptera* spp.); bobcats (*Lynx rufus*); coyotes; deer; foxes (*Vulpes vulpes*, *Urocyon cinereoargenteus*); hawks (*Buteo* spp.); hummingbirds (*Trochilidae* spp.); opossums (*Didelphis virginiana*); owls (*Strigiformes* spp.); rabbits (*Sylvilagus* spp.); raccoons; snakes (*Colubridae* spp.); squirrels/chipmunks (*Sciuridae* spp.); and turtles (*Terrapene* spp.). We selected these species based on the frequency of conflict wildlife reports and site visits by the GADNR related to injured, orphaned or trapped wildlife, and to ensure that we presented species that were likely to elicit a range of attitudes and emotions from respondents. As such, we expanded the research literature on urban wildlife, which has tended to focus on single species or taxa and seldom includes herpetiles (Magle et al., 2012). In the survey, we explained to respondents that 'for the purpose of this study, neighborhood refers to your zip code or the area within 1–2 miles of where you currently live'.

We then measured respondents' attitudes towards each species in their neighbourhood by asking whether they liked these animals living in their neighbourhood (strongly dislike = −2, dislike = −1, neither dislike nor like = 0, like = 1, strongly like = 2). To measure respondents' affect towards each species in their neighbourhood, we asked them to select which emotions they feel or would feel if they saw the animal, specifically: disgusted; scared; annoyed; caring or compassion; interested; and/or excited (binary coded as 1 if the respondent selected the emotion). Respondents could select multiple emotions for each species. They could also indicate whether they would feel no emotion. We defined wildlife tolerance as individuals' 'cultural carrying capacity' for wildlife, namely whether urban residents would prefer wildlife populations in their neighbourhood to change (large decrease = −2, small decrease = −1, stay the same = 0, small increase = 1, large increase = 2; Bruskotter et al., 2015).

2.2.2 | Respondents' interactions with wildlife

To measure respondents' interactions with wildlife, we asked whether they had any of the following interactions with wildlife around their residence or neighbourhood: watching wildlife; putting out food or seed for wildlife to eat; wildlife damage to their landscaping (e.g. digging holes and eating plants); wildlife raiding their trash cans; wildlife eating their pets' food; wildlife threatening or attacking their pets; wildlife entering their home; the respondent or household members feeling threatened by wildlife; the respondent or household members being scratched or bitten by wildlife; and the respondent or household members having a vehicle collision with wildlife. For each interaction, we asked how frequently these interactions occurred (once, a few times a year, seasonally, monthly, weekly or daily). We tailored questions to ensure that respondents without gardens or pets and who lived alone were not presented with interactions that did not pertain to them.

2.2.3 | Self-efficacy

To assess respondents' self-efficacy, we asked them whether they agreed (strongly disagree = −2, disagree = −1, neither agree nor disagree = 0, agree = 1, strongly agree = 2) that they had the ability to: prevent wildlife entering their property; keep their pets safe from wildlife; keep household members safe from wildlife; and keep themselves safe from wildlife. Again, we only presented appropriate statements, based on respondents' pet ownership and number of household members.

2.2.4 | Wildlife value orientations

We used the wildlife value orientation scale to measure whether respondents were traditionalists who believed that wildlife should be used and managed primarily for human benefit (domination value orientation) or mutualists who favour human–wildlife coexistence, viewing wildlife as deserving of rights and care (Chase et al., 2016). Respondents indicated their level of agreement (strongly disagree to strongly agree) with 14 statements designed to measure their beliefs about hunting, appropriate uses of wildlife, social affiliation between humans and wildlife and compassion for wildlife.

2.2.5 | Trust in the state wildlife agency

Finally, we assessed respondents' trust in the GADNR by asking them whether they agreed (strongly disagree to strongly agree) that the agency (1) has the resources and expertise to manage human-wildlife conflicts, (2) is responsive towards requests for assistance on wildlife issues, (3) provides adequate information on how to mitigate human-wildlife conflicts and (4) is effective in protecting wildlife in Georgia. Recognizing that respondents may not have interacted with the GADNR in the past, we allowed them to indicate if they 'didn't know' (coded as 0).

2.2.6 | Pretesting and ethics approval

We pretested our survey with 27 people, including experts in human dimensions research, wildlife ecologists and members of the public from the metropolitan Atlanta region. Pre-test participants varied in age and education levels and were representative of the racial

composition of metropolitan Atlanta. The University of Georgia Institutional Review Board (IRB) reviewed our final survey and determined that it was exempt (IRB ID: PROJECT00004965). We presented all respondents with an informed consent document, which detailed the objectives of the survey and the anticipated length of time to complete the survey. We further informed respondents that participation in the study was voluntary, all data collected would remain deidentified and that only adults aged 18 years or older could participate in the study. Respondents had to click a link agreeing to participate in our study before they were directed to the survey.

2.3 | Data collection

We hired Qualtrics Research Services to administer the survey to 1006 metropolitan Atlanta residents. We provided Qualtrics with demographic quotas for metropolitan Atlanta based on the United States Census to obtain a final sample that was representative in terms of county of residence, race, gender, age, income and education level. We collected data from January to April 2022. To ensure data quality, we included attention checks (i.e. we inserted statements that instructed respondents to select a specific answer to a question) and speed checks (i.e. we monitored the time taken to answer questions). Respondents who did not select the answer we specified because they had not read the question or answered long questions too rapidly based on the average response time for other respondents were excluded from the analysis.

2.4 | Data analysis

We performed all statistical analyses with SPSS version 28.0 and R version 4.2.1. First, we performed factor analysis to determine whether ordinal items could be combined to measure socio-psychological constructs (e.g. self-efficacy). We concluded that items could be combined to measure a construct if Cronbach's alpha ≥ 0.7 (a measure of internal consistency and inter-item reliability; Gliem & Gliem, 2003) and the items loaded onto a factor with an eigenvalue ≥ 1 (Joliffe & Morgan, 1992). We used varimax rotation to ensure that factors were orthogonal. After weighting each item by its factor loading, we summed items that loaded onto retained, orthogonal factors to generate composite scores (i.e. measures of socio-psychological constructs).

Second, we used ordinal logistic regression analysis to determine which variables influenced respondents' tolerance for each species. We regressed respondents' tolerance for individual species on their attitudes and affect towards the species, prior interactions with the species, self-efficacy, trust in the GADNR, wildlife value orientations and demographics (gender, age, education, income, race, household size, housing type, garden/landscaping, pet ownership). Both stepwise model reduction and a comparison of all possible models using the MuMIn package were conducted to determine the best-fit models. We identified the best-fit models based on the Akaike information criterion (AIC; Burnham et al., 2011), that is, the best-fit model had the lowest AIC. We conducted model averaging when there were multiple models that were within AIC ≤ 2 of the lowest AIC, that is, we averaged the coefficients across these models (Burnham et al., 2011). We considered a coefficient to be statistically significant at $p \leq 0.05$.

3 | RESULTS

Most respondents (57.1%) identified as female (Table S1). Respondents most frequently reported that they were Black or African American (54.1%) or white (42.8%). The median age category for respondents was 35–44 years of age, and the median household income category was $50,000–$74,999/year. The median education level for respondents was an associate's degree or some college (with no degree). Only 121 respondents (12.0%) lived alone. In total, 231 respondents (23.0%) had children living in their household. Our sample was representative of the larger population of metropolitan Atlanta both spatially and in terms of demographic composition, with the following exceptions. We oversampled people above the age of 55 years (31% of our sample versus 23% as per U.S. Census) and Black or African American residents of metropolitan Atlanta. We undersampled people with an income greater than $100,000/year (18% of our sample versus 27% as per U.S. Census) and Hispanic (3.8% of our sample) and Asian residents (1.2% of our sample) of metropolitan Atlanta. We also oversampled residents of Cobb, DeKalb, Gwinnett and Henry Counties (2%–5% more than census data) and undersampled residents of Fulton County (8% less than census data).

The largest share of respondents lived in a house (68.2%) with a garden (67.1%; Table S1). Respondents' gardens often contained lawn, shrubs and bushes, trees and flowering plants, thereby attracting and providing habitat for urban wildlife. Over half of respondents ($n = 562$, 55.9%) owned pets, predominantly dogs. The largest share of respondents (32.9%) had lived in their neighbourhood for ≥11 years, which suggests that they would be familiar with which wildlife live in their neighbourhood and how wildlife populations have changed over time.

Respondents most frequently reported that squirrels/chipmunks (89.1% of respondents), rabbits (65.0%), deer (62.0%), hummingbirds (52.5%) and raccoons (51%) are found in their neighbourhood (Table 1). Only 33 respondents (3.3%) were aware of bobcats in their neighbourhood (thus, we did not conduct regression analysis for the bobcat, owing to the low sample size). Respondents stated that their most frequent interaction with the various wildlife was to watch them around their residence or neighbourhood, followed by putting out food or seed for wildlife to eat (Table S2). The most frequently reported conflicts with wildlife were raccoons and opossums raiding trash cans, squirrels/chipmunks, rabbits and deer damaging landscaping, and vehicle collisions with deer. On average, 0.5% of respondents reported that the species included in the survey had threatened or injured their pets, household members or themselves. Typically, these conflicts had occurred only once or a few times.

TABLE 1 Respondents' tolerance for wildlife, metropolitan Atlanta, United States, January–April 2022 ($n = 1006$).

	Percent and number of respondents who stated that species are present in their neighbourhood	Respondents' preference for how the number of animals in their neighbourhood should change					
		Median	Large decrease	Small decrease	Stay the same	Small increase	Large increase
Bat	24.8% (249)	Stay the same	21.3% (53)	14.9% (37)	42.6% (106)	15.7% (39)	5.6% (14)
Bobcat	3.3% (33)	Small decrease	33.3% (11)	33.3% (11)	21.2% (7)	12.1% (4)	0.00% (0)
Coyote	30.9% (311)	Small decrease	47.9% (149)	20.3% (63)	28.0% (87)	2.9% (9)	1.0% (3)
Deer	62.0% (624)	Stay the same	8.0% (50)	13.5% (84)	58.7% (366)	13.0% (81)	6.9% (43)
Fox	26.3% (265)	Stay the same	23.0% (61)	17.7% (47)	48.3% (128)	9.8% (26)	1.1% (3)
Hawk	39.9% (401)	Stay the same	5.2% (21)	9.5% (38)	57.1% (229)	22.2% (89)	6.0% (24)
Hummingbird	52.5% (528)	Small increase	1.3% (7)	3.6% (19)	34.8% (184)	30.3% (160)	29.9% (158)
Opossum	49.6% (499)	Small decrease	31.5% (157)	22.8% (114)	38.5% (192)	5.2% (26)	2.0% (10)
Owl	43.8% (441)	Stay the same	3.2% (14)	7.5% (33)	55.1% (243)	24.5% (108)	9.8% (43)
Rabbit	65.0% (654)	Stay the same	2.6% (17)	7.5% (49)	59.2% (387)	22.6% (148)	8.1% (53)
Raccoon	51.0% (513)	Stay the same	22.0% (113)	23.4% (120)	46.2% (237)	7.4% (38)	1.0% (5)
Snake	44.7% (450)	Small decrease	48.0% (216)	20.2% (91)	25.8% (116)	4.7% (21)	1.3% (6)
Squirrels/chipmunks	89.1% (896)	Stay the same	9.3% (83)	15.2% (136)	63.5% (569)	8.4% (75)	3.7% (33)
Turtle	34.3% (345)	Stay the same	2.6% (9)	5.8% (20)	63.2% (218)	21.2% (73)	7.2% (25)

Note: Number of respondents who provided each response are presented in parentheses.

Although we found heterogeneity in respondents' tolerance for the various species, most respondents were intolerant of bobcats, coyotes, opossums and snakes, indicating that they would prefer the populations of these species in their neighbourhood to decline (Table 1). On average, respondents preferred the populations of all other species to remain unchanged, with the exception of hummingbirds, which they preferred to increase in numbers. Consistent with tolerance measures, most respondents disliked bobcats, coyotes and snakes, although they neither liked nor disliked opossums (Figure 2; Table S3). Most respondents liked deer, hawks, owls, rabbits, squirrels/chipmunks and turtles, and they strongly liked hummingbirds. On average, respondents neither liked nor disliked bats, foxes and raccoons. Respondents predominantly reported fear when asked how they would feel if they saw bobcats, coyotes or snakes in their neighbourhood (Figure 3; Table S4). Their predominant emotion pertaining to opossums was disgust. Respondents most frequently indicated that they would be 'interested' if they saw bats, foxes, hawks, owls, raccoons, deer or turtles. They indicated that they would be 'interested' and/or 'caring and compassionate' if they saw rabbits. Respondents tended to be 'excited' if they saw hummingbirds. However, we note that respondents were heterogeneous in their attitudes and affect towards different species. For example, some respondents reported positive affect towards coyotes and snakes, indicating that they would be interested or excited if they saw these species, and that they feel compassion for coyotes and snakes.

On average, respondents agreed that they had the ability to keep themselves, members of their household and their pets safe from wildlife, but they neither agreed nor disagreed that they had the ability to prevent wildlife entering their property (Table S5). Factor analysis (eigenvalue = 1.353, Cronbach's alpha = 0.79) indicated that respondents' perceived ability to keep themselves and their property safe from wildlife could be treated as a single construct, 'self efficacy'. On average, respondents agreed that the GADNR has the appropriate resources to manage wildlife and the necessary expertise to manage human–wildlife conflicts (Table S6). However, respondents tended to be neutral in their assessment about whether the GADNR provided adequate information about preventing human–wildlife conflicts, responded to requests for assistance on wildlife issues and had been effective in protecting wildlife. Based on factor analysis (eigenvalue = 3.378, Cronbach's alpha = 0.88), we combined these statements to measure respondents' 'trust in the state wildlife agency'.

When asked to indicate their beliefs about wildlife, most respondents agreed that they value the sense of companionship they receive from animals, people should strive for a world where humans and wildlife can live side by side without fear, they care about animals as much as they do about other people and they view all living things as part of one big family (Table S7). On average, respondents disagreed that wildlife are on earth primarily for people to use. After conducting factor analysis, we combined the wildlife value orientation items into three constructs, namely 'mutualism' (eigenvalue = 4.746, Cronbach's alpha = 0.88); 'hunting beliefs' (eigenvalue = 2.227, Cronbach's alpha = 0.78); and 'utilitarian views of wildlife' (eigenvalue = 1.511, Cronbach's alpha = 0.73).

3.1 | Predictors of species tolerance

Respondents' attitudes towards species were positive predictors of their tolerance for all species, that is, respondents who liked

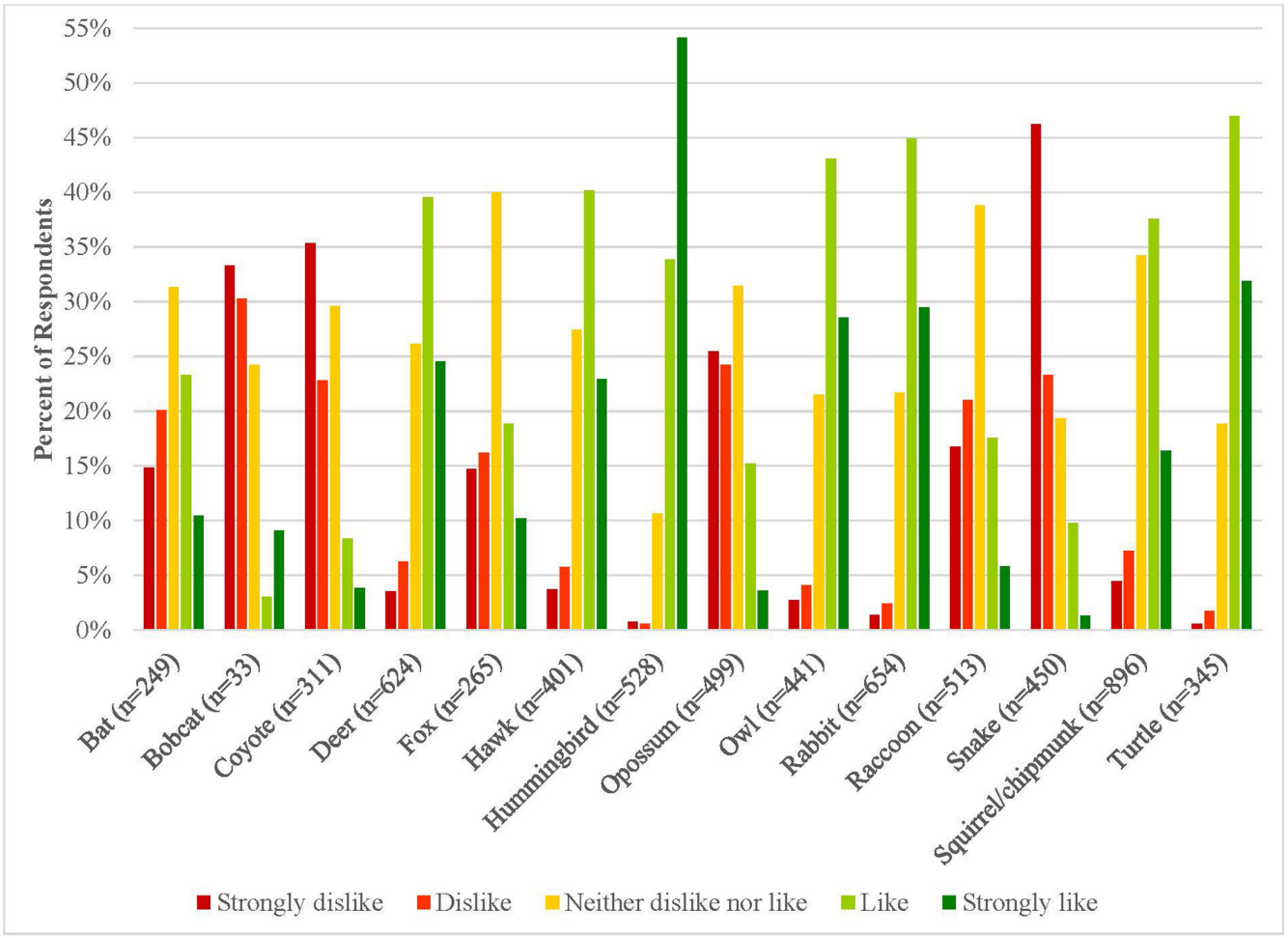

FIGURE 2 Respondents' attitudes towards wildlife in metropolitan Atlanta, United States, January–April 2022 (*n*: number of respondents who reported that they had seen, or heard of sightings of, each species in their neighbourhood). Median response was 'dislike' for bobcats, coyotes, and snakes. Median response was 'neither dislike nor like' for bats, foxes, opossums, and raccoons. Median response was 'like' for deer, hawks, owls, rabbits, squirrels/chipmunks, and turtles. Median response was 'strongly like' for hummingbirds.

each species were more likely to indicate that they wanted the population of these species to increase (Table 2). Across all species, respondents' tolerance also depended on their affect towards the species. Respondents who feared bats, coyotes, raccoons, snakes or turtles preferred the populations of these species in their neighbourhood to decrease. Respondents who were disgusted by opossums, rabbits or snakes were also more likely to be intolerant of these species, but disgust with owls increased tolerance for owls, which was unexpected. Annoyance reduced respondents' tolerance for bats, deer, hawks, owls, rabbits, raccoons and squirrels/chipmunks. By contrast, respondents who were excited to see bats, deer, foxes, hawks, hummingbirds, owls, rabbits or squirrels/chipmunks in their neighbourhood were more likely to be tolerant of these species. Interest was a positive predictor of respondents' tolerance for bats, foxes, owls, raccoons and squirrels/chipmunks. Compassion was a positive predictor of respondents' tolerance for coyotes and foxes. Respondents who were mutualistic in their beliefs about wildlife were also more likely to be tolerant of coyotes, deer, opossums, snakes and squirrels/chipmunks. Neither respondents' beliefs about hunting nor their beliefs about humans' rights to use wildlife influenced their tolerance for the different species.

With the exception of foxes, opossums and snakes, respondents' tolerance for species depended on their prior interactions with these species. Respondents who felt personally threatened by bats and coyotes and respondents whose pets were threatened by hawks were less tolerant of these three species. Similarly, respondents who had experienced damage to their yards or landscaping by raccoons and squirrels/chipmunks were less tolerant of these species. Respondents who had experienced a vehicle collision with a deer were less likely to be tolerant of deer. Watching species increased respondents' tolerance for hawks, hummingbirds, owls, rabbits and turtles, but respondents who reported seeing opossums and raccoons were more likely to be intolerant of these species. Respondents who fed wildlife were more tolerant of hawks and hummingbirds. Wildlife raiding the trash, entering respondents' homes and threatening members of the household did not influence respondents' wildlife tolerance.

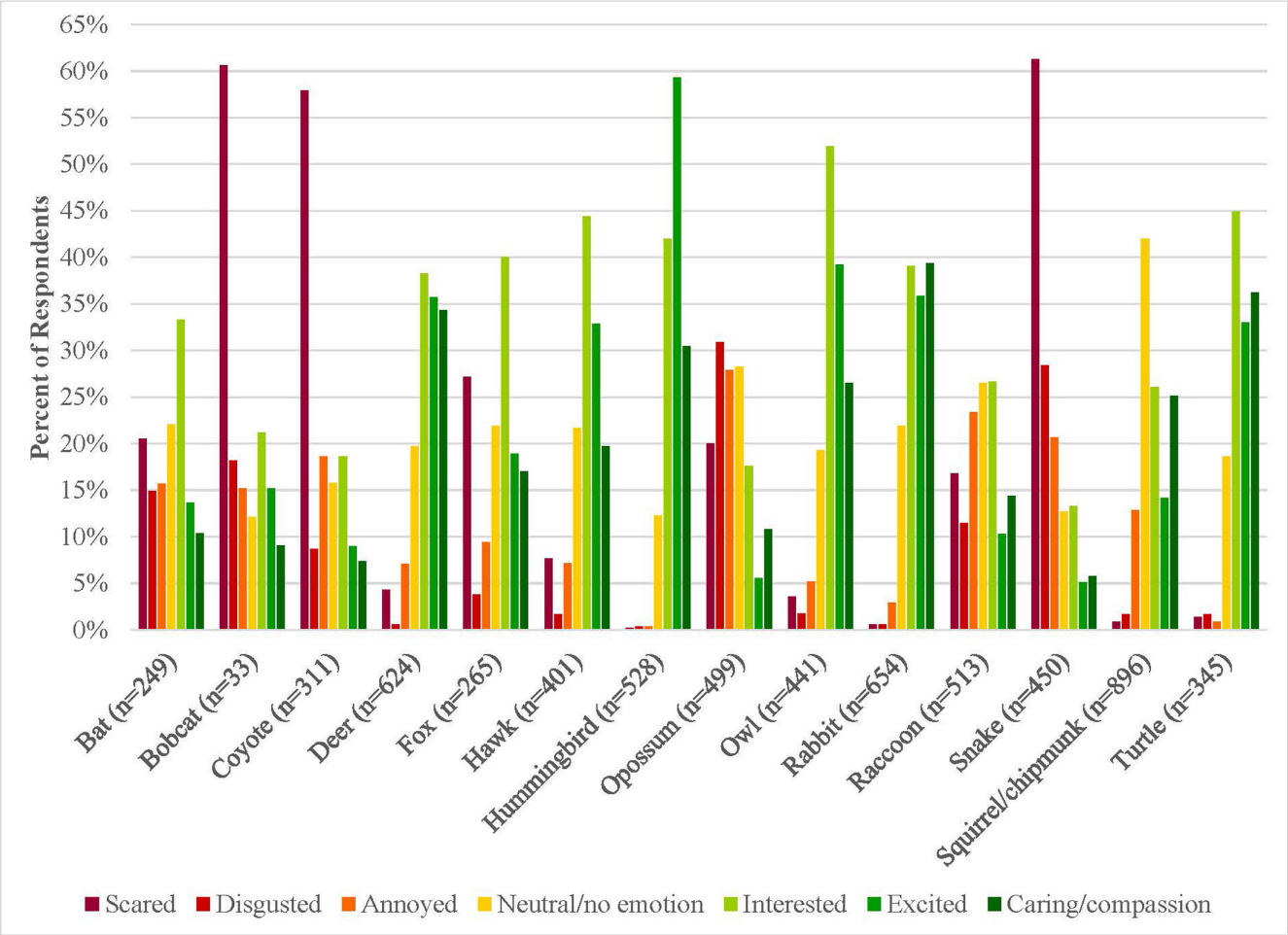

FIGURE 3 Respondents' emotions towards wildlife, metropolitan Atlanta, United States, January–April 2022 (*n*: number of respondents who reported that they had seen, or heard of sightings of, each species in their neighbourhood).

We found no evidence that respondents' wildlife tolerance was influenced by their trust in the GADNR to manage wildlife and human–wildlife conflicts. However, we found some evidence that self-efficacy increased respondents' tolerance for species. Respondents who reported that they had the ability to keep themselves and their property safe from wildlife were likely to be more tolerant of owls. Respondents who disagreed that they were able to keep their pets safe from wildlife were likely to be less tolerant of hawks. Unexpectedly, respondents who disagreed that they were able to keep their household members and pets safe from wildlife were more likely to be tolerant of raccoons and snakes, respectively.

Females were less likely to be tolerant of foxes, owls and snakes. Older respondents were more likely to be tolerant of bats and hummingbirds but were less likely to be tolerant of coyotes, rabbits and squirrels/chipmunks. Respondents with higher levels of education were more likely to be tolerant of bats. Black or African American respondents were less tolerant of foxes but more tolerant of squirrels/chipmunks, while Hispanic respondents were less tolerant of owls and rabbits.

4 | DISCUSSION

Human tolerance for wildlife is critical to wildlife conservation in urban spaces (McCance et al., 2017). Although wildlife management agencies typically seek to address human–wildlife conflicts by educating people about wildlife and how to mitigate conflicts (Schell et al., 2021), research suggests that increasing wildlife tolerance is a more effective long-term strategy to attain conservation outcomes (Bruskotter & Wilson, 2014), especially in urban environments with large populations of people and wildlife. Moreover, increased understanding of whether wildlife tolerance varies across racial and socio-economic groups is important, given prevailing issues of ecological gentrification and environmental injustice in urban spaces (Dai, 2011; Roberts-Gregory & Hawthorne, 2016; Schell et al., 2020; Wu, 2014). We investigated tolerance for a suite of urban wildlife in metropolitan Atlanta, a rapidly growing metropolitan region that is characterized by expanding urban wildlife populations, and high levels of residential segregation and gentrification (Cole & Immergluck, 2021; Lee, 2011; Strait & Gong, 2015).

TABLE 2 Ordinal logistic regression analysis of respondents' tolerance for different wildlife species, metropolitan Atlanta, United States, 2022.

	Bat	Coyote	Deer	Fox	Hawk	Hummingbird	Opossum	Owl	Rabbit	Raccoon	Snake	Squirrel/ chipmunk	Turtle
Attitudes	1.20***	0.98***	1.16***	1.14***	0.77***	1.01***	1.02***	0.74***	0.93***	1.17***	1.00***	0.75***	1.11***
Affect													
Scared	−0.79*	−0.58*		−0.62		−3.01		−0.68		−0.84**	−0.52*	−1.33	−2.09*
Disgust	−0.63			−1.67		−2.55	−1.05***	3.66***	−3.76**	−0.56	−1.07***		
Annoyed	−1.01*		−1.13**		−1.48**		−0.30	−2.84***	−1.68**	−0.65**	−0.43	−1.73***	−1.41
Interested	0.75*	0.44		0.90**				0.43*		0.51*		0.48**	
Excited	1.38**		0.91***	2.00***	1.51***	0.90***		1.20***	0.83***			0.98***	0.51
Compassion	0.51	1.13*		0.87*		0.17			0.20				
Value orientations													
Mutualism		0.42**	0.22*	0.26		−0.08	0.41***			0.20	0.46***	0.21*	0.13
Hunting beliefs	−0.24	−0.26										−0.14	
Utilitarian views			0.18						0.17		0.15	0.15	
Interactions													
Watch wildlife													
Daily				−0.69		0.69**		0.61*	0.29			−0.26	0.84*
Weekly				−1.04						−1.00*		−0.28	
Monthly						0.36			−0.40			−0.52	
Seasonally					0.96*	0.75*	−0.91*		0.87**				
Few times					1.00*				0.44				
Feed wildlife													
Daily			0.90			0.70			0.90	0.82			
Weekly			0.68		2.02*	0.64*							
Monthly					−1.87								
Seasonally			−0.95			0.52							
Damage landscaping													
Few times										−1.58*		−0.74	
Seasonally			−0.52							−1.18*		−0.84*	
Raid trash weekly		−1.91											
Threaten pets													
Weekly								−2.09					
Few times					−3.79**								
Once								−1.62					

TABLE 2 (Continued)

	Bat	Coyote	Deer	Fox	Hawk	Hummingbird	Opossum	Owl	Rabbit	Raccoon	Snake	Squirrel/ chipmunk	Turtle
Threaten household member a few times				2.24			−1.72						
Threaten respondent													
Few times	−2.93*	−1.91*											
Once		−1.59											
Vehicle collision once			−0.83*										
Enter house a few times											1.24		
Self efficacy		−0.18	0.23					0.42**		0.29	−0.29		
Household members[a]							0.62			1.29*	0.91		
Pets[a]		−2.56			−1.91*						1.99*		
Trust in the GADNR		−0.27	−0.14				−0.19						
Female	−0.37	−0.36		−0.59*	−0.40		−0.23	−0.50*			−0.57**		
Age	0.02*	−0.03**				0.02**		0.01	−0.01**		−0.01	−0.01*	
Education	0.17*				0.05	0.05							
Black			−0.22	−0.88**	−0.24				−0.29			0.46**	
Hispanic								−1.58***	−1.05*		−0.74		
Own pets				0.42	−0.11		0.17	−0.16					
Intercepts													
β_1	0.72	−2.51	−2.51	−2.09	−3.10	−1.92	−2.01	−3.43	−4.17	−2.50	−2.48	−3.08	−2.71
β_2	2.16	−1.14	−0.79	−0.57	−1.41	−0.41	−0.49	−1.40	−2.25	−0.70	−1.05	−1.31	−1.23
β_3	5.80	2.24	3.03	3.98	2.38	2.78	2.67	2.58	1.52	2.99	1.65	2.78	2.82
β_4	8.03	3.75	4.50	7.23	4.64	4.47	4.12	4.55	3.40	5.43	3.30	4.19	4.71
N	249	311	624	265	401	528	499	441	654	513	450	896	345
Log-likelihood	−243.3	−280.6	−609.1	−224.3	−383.8	−567.9	−516.6	−423.2	−637.3	−499.0	−425.9	−811.5	−320.8
AIC[b]	517.4	595.7	1250.9	482.0	793.6	1161.8	1059.1	876.4	1302.6	1028.8	883.9	1657.0	662.2

Note: Tolerance was measured as respondents' preferences for changes in species populations in their neighbourhood (large decrease = −2, small decrease = −1, stay the same = 0, small increase = 1, large increase = 2). Significance levels: ***$p \leq 0.001$; **$p \leq 0.01$; *$p \leq 0.05$.

[a]Coded as 'strongly disagree' or 'disagree' that the respondent had the ability to keep household members or pets safe = 1; 'neither disagree nor agree', 'agree', and 'strongly agree' coded as 0.

[b]Reported AIC and log likelihood from the model with the lowest AIC. Coefficient averages calculated for models within AIC ≤2 of the model with the lowest AIC.

Consistent with prior research (Kansky et al., 2014), we found that respondents' tolerance differed across species. Respondents indicated least tolerance for urban carnivores (bobcats, coyotes, opossums and raccoons) and snakes, although respondents were heterogeneous in their tolerance for these species. Small- and medium-sized carnivores can achieve high population densities in urban and suburban environments by exploiting anthropogenic sources of food and water, reduced threats from sympatric carnivores and utilizing small patches of natural cover and altered physical environments for shelter (Bateman & Fleming, 2012). However, urbanization typically decreases snake species richness and abundance, in part owing to human-induced mortality of snakes (Fischer et al., 2012). Maintaining carnivore and snake populations in urban ecosystems is necessary because they play important roles in the regulation of ecosystems (e.g. natural pest control, nutrient cycling; Do Linh San et al., 2022; Kontsiotis et al., 2022). Accordingly, it is important to consider how increased tolerance of urban carnivores and snakes can be attained in metropolitan Atlanta, while also maintaining or increasing existing tolerance for other urban wildlife.

Humans' responses to wildlife depend on both their cognitive and analytical processes (which encompasses attitudes) and their experiential processes (which encompasses affect and emotion; Epstein, 1994). Negative attitudes and emotions towards wildlife can influence people's cognitions of wildlife, thereby biasing their judgements of wildlife and resulting in exaggerated perceptions of conflict (Slagle & Bruskotter, 2019). Respondents' lower tolerance of coyotes, opossums, raccoons and snakes was largely attributable to their attitudes (i.e. dislike), fear and disgust associated with these species. This is consistent with prior findings that carnivores and snakes generate strong emotional responses in humans (e.g. admiration, disgust, fear and hate), which influences how humans interact with these animals and their support for species conservation (Frank et al., 2016; Johansson et al., 2012; Onyishi et al., 2021). Importantly, people's emotional responses to carnivores have been shown to be stronger predictors of their support for carnivore conservation than knowledge or beliefs (Slagle et al., 2012). People's emotional dispositions can be learned (based on experience) or innate (Jacobs et al., 2012). Negative emotions towards wildlife may also be an artefact of perceived threats conveyed through culture and mythology (e.g. bats and vampirism; Prokop et al., 2009), media portrayals of wildlife (e.g. predators threatening humans; Howlett et al., 2023) or social media (e.g. videos showing conflicts between people and raccoons or opossums; Fidino et al., 2018).

The strong role of emotions and attitudes in determining human tolerance for wildlife presents a considerable management challenge for wildlife agencies. Agencies and conservation practitioners often assume that high levels of conflict and intolerance towards wildlife are driven by direct conflicts with wildlife, and thus, the appropriate response is to work with the public to prevent and mitigate wildlife-related damages and losses (Dickman, 2010; McCance et al., 2017). However, respondents reported few conflicts with wildlife, and prior conflicts with species seldom influenced tolerance. Our study suggests that reports to the GADNR about human–wildlife conflicts may overstate the frequency of conflicts and public intolerance for species. Educating the public on how to prevent threats to their pets and trash raiding does make sense to improve tolerance for coyotes, raccoons and other urban wildlife. But conservation education pertaining to urban wildlife should also seek to reinforce positive attitudes and emotions towards wildlife (Ballantyne et al., 2007; Skupien et al., 2016). Effective education strategies engage people both cognitively and emotionally (Ballantyne et al., 2007). These strategies include observing animals and their behaviours (e.g. bird watching or wildlife viewing in urban parks), opportunities for positive interactions with wildlife (e.g. through interactions with wildlife at educational events), using persuasive communication and providing advice on everyday actions people can take to assist in wildlife conservation (Ballantyne et al., 2007; Skupien et al., 2016).

Persuasive communication may help to secure urban wildlife conservation by targeting people's relevant behavioural, normative and control beliefs (Ballantyne et al., 2007). Behavioural beliefs are people's beliefs about the outcomes and consequences of behaviours (e.g. tolerating interactions with wildlife, rather than reporting conflicts or seeking to relocate wildlife). Normative beliefs are beliefs about society's expectations about behaviours, whereas control beliefs encompass people's beliefs about their ability, knowledge, skills, resources and opportunities to perform behaviours (i.e. their self-efficacy). We note that respondents with mutualism value orientations were more likely to be tolerant of coyotes, deer, opossums, snakes, squirrels and chipmunks. This suggests that persuasive communication that reinforces existing beliefs that humans and wildlife can coexist may increase support for wildlife conservation in metropolitan Atlanta. Consistent with prior research demonstrating a positive relationship between self-efficacy and wildlife tolerance (Zajac et al., 2012), we found that respondents with greater self-efficacy were more likely to be tolerant of owls, whereas respondents who reported lower self-efficacy with respect to protecting their pets from wildlife were less likely to be tolerant of hawks, which are perceived as a threat to small pets. Contrary to expectations, we found an inverse relationship between self-efficacy (in terms of protecting pets and family from wildlife) and tolerance for snakes and raccoons. This result may be an artefact of the design of our self-efficacy statements, which were generic and not specific to each focal species. Nonetheless, our findings do suggest that communication that reinforces people's beliefs in their ability to manage potential conflicts with wildlife is needed to increase tolerance for urban wildlife and support for wildlife conservation in metropolitan Atlanta.

Communication strategies should also be tailored to different demographics. We found that older respondents were more tolerant of bats and hummingbirds, while younger respondents were more tolerant of coyotes, rabbits, squirrels and chipmunks. Older people may be likely to engage in more pro-environmental behaviours (Gifford & Nilsson, 2014) such as establishing pollinator gardens and providing bird baths. Younger people tend to be more

environmentally concerned (Gifford & Nilsson, 2014), which may manifest as higher tolerance for conflict species. Communication should further seek to reduce women's aversion to predators (e.g. foxes, hawks, owls and snakes in our study; Bjerke & Østdahl, 2004).

Interestingly, we found little evidence that race influenced wildlife tolerance, which was contrary to our prior predictions based on the environmental justice literature (Des Roches et al., 2021; Schell et al., 2021). Given the history of gentrification in Atlanta, and non-uniform distribution of green space and environmental amenities (Immergluck & Balan, 2018), we expected lower levels of tolerance towards urban wildlife by Black and Hispanic respondents—especially if respondents relied on backyard vegetable gardens to offset the absence of fresh food stores in their community. We did find that Black respondents were less tolerant of foxes and more tolerant of squirrels and chipmunks, while Hispanic respondents were less tolerant of owls and rabbits. But our results suggest that minority communities may not be experiencing higher levels of conflict with urban wildlife. More research is needed to understand what social and cultural beliefs in minority communities underpin urban wildlife tolerance, how minority communities may benefit from urban wildlife and how urban wildlife impacts people living in impoverished, historically Black neighbourhoods.

The GADNR already has a platform for effective wildlife education that engages metropolitan Atlanta residents cognitively and emotionally. The GADNR Urban Wildlife Program (https://georgiawildlife.com/urbanwildlifeprogram) is dedicated to helping metropolitan Atlanta residents prevent or resolve conflicts with wildlife, while promoting desired wildlife habitat and conservation in backyards. As part of this program, the GADNR engages in outreach and education efforts and situation-specific technical assistance, which is consistent with providing advice on everyday actions people can take to assist in wildlife conservation (Ballantyne et al., 2007; Skupien et al., 2016). The Urban Wildlife Program presents an important conduit to increased wildlife tolerance in metropolitan Atlanta, especially if metropolitan Atlanta residents trust the agency. Trust in government organizations has been shown to be an important determinant of wildlife tolerance (Redpath et al., 2015), reducing the public's perceptions of the risks posed by wildlife (Bruskotter & Wilson, 2014). Although we found no correlation between respondents' wildlife tolerance and their trust in the GADNR to manage wildlife and mitigate human–wildlife conflicts, this was likely because most respondents had not previously engaged with the GADNR. Although 536 respondents (53.3%) had previously heard of the GADNR, only 125 respondents (12.4%) had previously interacted with the agency. The Urban Wildlife Program could allow the GADNR to gain more visibility with residents, especially since respondents predominantly selected the GADNR ($n = 456$, 45.3%) when asked who they would reach out to if they faced problems with wildlife. In addition to persuasive communication and outreach efforts, the Urban Wildlife Program could incorporate opportunities for community science (also referred to as citizen science), thereby providing opportunities for the public to observe animals and their behaviours. By using effective education methods and partnering with other environmental education organizations, the GADNR has the ability to increase tolerance for urban wildlife in metropolitan Atlanta—a critical precondition for wildlife conservation in urban spaces.

5 | CONCLUSIONS

Globally, 68% of the human population is expected to live in urban areas by 2050 (United Nations, Department of Economic and Social Affairs, Population Division, 2019), resulting in rapid urban expansion, loss of natural habitats and negative impacts on wildlife populations, ecology and behaviour. As such, wildlife conservation critically depends on human tolerance for wildlife in urban areas. Our results suggest that urban residents' tolerance for wildlife is significantly influenced by their attitudes and emotions towards wildlife, as well as their beliefs about the relationships between humans and wildlife (i.e. mutualistic beliefs about the importance of coexistence between humans and wildlife). Although educating urban residents about wildlife and how to mitigate conflicts with wildlife is important, our findings suggest that conservation organizations could use persuasive communication to improve attitudes and reinforce positive emotions towards wildlife in urban environments. Heterogeneity in people's tolerance for different wildlife species should also be taken into account when targeting education and outreach efforts.

AUTHOR CONTRIBUTIONS

Mahi Puri was involved in methodology, formal analysis, investigation, data curation, writing—original draft and visualization. Kristina L. Johannsen and Kaitlin O. Goode were involved in conceptualization, methodology and writing—review & editing. Elizabeth F. Pienaar was involved in conceptualization, methodology, investigation, resources, writing—review & editing, visualization, supervision, project administration and funding acquisition.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

Deidentified data supporting our results are publicly available on Zenodo at: https://doi.org/10.5281/zenodo.10447632.

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REFERENCES

Aronson, M. F., Lepczyk, C. A., Evans, K. L., Goddard, M. A., Lerman, S. B., MacIvor, J. S., Nilon, C. H., & Vargo, T. (2017). Biodiversity in the city: Key challenges for urban green space management. *Frontiers in Ecology and the Environment*, *15*, 189–196.

Ballantyne, R., Packer, J., Hughes, K., & Dierking, L. (2007). Conservation learning in wildlife tourism settings: Lessons from research in zoos and aquariums. *Environmental Education Research*, *13*, 367–383.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*, 191–215.

Bateman, P. W., & Fleming, P. A. (2012). Big city life: Carnivores in urban environments. *Journal of Zoology*, *287*, 1–23.

Bjerke, T., & Østdahl, T. (2004). Animal-related attitudes and activities in an urban population. *Anthrozoös*, *17*, 109–129.

Bruskotter, J. T., Singh, A., Fulton, D. C., & Slagle, K. (2015). Assessing tolerance for wildlife: Clarifying relations between concepts and measures. *Human Dimensions of Wildlife*, *20*, 255–270.

Bruskotter, J. T., & Wilson, R. S. (2014). Determining where the wild things will be: Using psychological theory to find tolerance for large carnivores. *Conservation Letters*, *7*, 158–165.

Burnham, K. P., Anderson, D. R., & Huyvaert, K. P. (2011). AIC model selection and multimodel inference in behavioral ecology: Some background, observations, and comparisons. *Behavioral Ecology and Sociobiology*, *65*, 23–35.

Chase, L. D., Teel, T. L., Thornton-Chase, M. R., & Manfredo, M. J. (2016). A comparison of quantitative and qualitative methods to measure wildlife value orientations among diverse audiences: A case study of Latinos in the American southwest. *Society & Natural Resources*, *29*, 572–587.

Cole, H., & Immergluck, D. (2021). Reshaping legacies of green and transit justice through the Atlanta BeltLine. In I. Anguelovski & J. J. T. Connolly (Eds.), *The Green City and social injustice: 21 Tales from North America and Europe*. Routledge.

Dai, D. (2011). Racial/ethnic and socioeconomic disparities in urban green space accessibility: Where to intervene? *Landscape and Urban Planning*, *102*, 234–244.

Des Roches, S., Brans, K. I., Lambert, M. R., Rivkin, L. R., Savage, A. M., Schell, C. J., Correa, C., De Meester, L., Diamond, S. E., Grimm, N. B., & Harris, N. C. (2021). Socio-eco-evolutionary dynamics in cities. *Evolutionary Applications*, *14*, 248–267.

Dickman, A. J. (2010). Complexities of conflict: The importance of considering social factors for effectively resolving human–wildlife conflict. *Animal Conservation*, *13*, 458–466.

Do Linh San, E., Sato, J. J., Belant, J. L., & Somers, M. J. (2022). The world's small carnivores: Definitions, richness, distribution, conservation status, ecological roles, and research efforts. In E. Do Linh San, J. J. Sato, J. L. Belant, & M. J. Somers (Eds.), *Small carnivores: Evolution, ecology, behaviour, and conservation* (pp. 1–38). John Wiley & Sons.

Epstein, S. (1994). Integration of the cognitive and psychodynamic unconscious. *American Psychologist*, *49*, 709–724.

Fidino, M., Herr, S. W., & Magle, S. B. (2018). Assessing online opinions of wildlife through social media. *Human Dimensions of Wildlife*, *23*, 482–490.

Fischer, J. D., Cleeton, S. H., Lyons, T. P., & Miller, J. R. (2012). Urbanization and the predation paradox: The role of trophic dynamics in structuring vertebrate communities. *BioScience*, *62*, 809–818.

Fischer, J. D., Schneider, S. C., Ahlers, A. A., & Miller, J. R. (2015). Categorizing wildlife responses to urbanization and conservation implications of terminology. *Conservation Biology*, *29*, 1246–1248.

Frank, B., Glikman, J. A., Sutherland, M., & Bath, A. J. (2016). Predictors of extreme negative feelings toward coyote in Newfoundland. *Human Dimensions of Wildlife*, *21*, 297–310.

Gifford, R., & Nilsson, A. (2014). Personal and social factors that influence pro-environmental concern and behaviour: A review. *International Journal of Psychology*, *49*, 141–157.

Gliem, J. A., & Gliem, R. R. (2003). Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales. *Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education*. Ohio State University, Columbus, USA.

Holman, C. (2016). *How well do you know Atlanta's historically black neighborhoods?*. The Atlanta Journal-Constitution. https://www.ajc.com/lifestyles/how-well-you-know-atlanta-historically-black-neighborhoods/XI5oFU29CIqhw24Sw7w9QJ/

Howlett, K., Lee, H. Y., Jaffé, A., Lewis, M., & Turner, E. C. (2023). Wildlife documentaries present a diverse, but biased, portrayal of the natural world. *People and Nature*, *5*, 633–644. https://doi.org/10.1002/pan3.10431

Immergluck, D., & Balan, T. (2018). Sustainable for whom? Green urban development, environmental gentrification, and the Atlanta Beltline. *Urban Geography*, *39*, 546–562.

Jacobs, M. H., Vaske, J. J., & Roemer, J. M. (2012). Toward a mental systems approach to human relationships with wildlife: The role of emotional dispositions. *Human Dimensions of Wildlife*, *17*, 4–15.

Jacobs, M. H., Vaske, J. J., & Sijtsma, M. T. (2014). Predictive potential of wildlife value orientations for acceptability of management interventions. *Journal for Nature Conservation*, *22*, 377–383.

Johansson, M., Sjöström, M., Karlsson, J., & Brännlund, R. (2012). Is human fear affecting public willingness to pay for the management and conservation of large carnivores? *Society & Natural Resources*, *25*, 610–620.

Joliffe, I. T., & Morgan, B. J. T. (1992). Principal component analysis and exploratory factor analysis. *Statistical Methods in Medical Research*, *1*, 69–95.

Kansky, R., Kidd, M., & Knight, A. T. (2014). Meta-analysis of attitudes toward damage-causing mammalian wildlife. *Conservation Biology*, *28*, 924–938.

Kansky, R., Kidd, M., & Knight, A. T. (2016). A wildlife tolerance model and case study for understanding human wildlife conflicts. *Biological Conservation*, *201*, 137–145.

Kimmig, S. E., Flemming, D., Kimmerle, J., Cress, U., & Brandt, M. (2020). Elucidating the socio-demographics of wildlife tolerance using the example of the red fox (*Vulpes vulpes*) in Germany. *Conservation Science and Practice*, *2*, e212.

Klöckner, C. A. (2013). A comprehensive model of the psychology of environmental behaviour—A meta-analysis. *Global Environmental Change*, *23*, 1028–1038.

Kontsiotis, V. J., Rapti, A., & Liordos, V. (2022). Public attitudes towards venomous and non-venomous snakes. *Science of the Total Environment*, *831*, 154918.

Lee, S. (2011). Analyzing intra-metropolitan poverty differentiation: Causes and consequences of poverty expansion to suburbs in the metropolitan Atlanta region. *The Annals of Regional Science*, *46*, 37–57.

Liu, T., & Yang, X. (2015). Monitoring land changes in an urban area using satellite imagery, GIS and landscape metrics. *Applied Geography*, *56*, 42–54.

Lo, C. P., & Yang, X. (2002). Drivers of land-use/land-cover changes and dynamic modeling for the Atlanta, Georgia metropolitan area. *Photogrammetric Engineering and Remote Sensing*, *68*, 1073–1082.

Magle, S. B., Hunt, V. M., Vernon, M., & Crooks, K. R. (2012). Urban wildlife research: Past, present, and future. *Biological Conservation*, *155*, 23–32.

Manfredo, M. J., Teel, T. L., Don Carlos, A. W., Sullivan, L., Bright, A. D., Dietsch, A. M., Bruskotter, J., & Fulton, D. (2020). The changing sociocultural context of wildlife conservation. *Conservation Biology*, *34*, 1549–1559.

Manfredo, M. J., Teel, T. L., & Henry, K. L. (2009). Linking society and environment: A multilevel model of shifting wildlife value orientations in the western United States. *Social Science Quarterly*, *90*, 407–427.

McCance, E. C., Decker, D. J., Colturi, A. M., Baydack, R. K., Siemer, W. F., Curtis, P. D., & Eason, T. (2017). Importance of urban wildlife management in the United States and Canada. *Mammal Study*, *42*, 1–16.

Miller, M. D. (2012). The impacts of Atlanta's urban sprawl on forest cover and fragmentation. *Applied Geography*, *34*, 171–179.

Onyishi, I. E., Nwonyi, S. K., Pazda, A., & Prokop, P. (2021). Attitudes and behaviour toward snakes on the part of Igbo people in southeastern Nigeria. *Science of the Total Environment*, *763*, 143045.

Philo, C., & Wilbert, C. (2004). *Animal spaces, beastly places*. Routledge.

Prokop, P., Fančovičová, J., & Kubiatko, M. (2009). Vampires are still alive: Slovakian students' attitudes toward bats. *Anthrozoös*, *22*, 19–30.

Redpath, S. M., Bhatia, S., & Young, J. (2015). Tilting at wildlife: Reconsidering human–wildlife conflict. *Oryx*, *49*, 222–225.

Roberts-Gregory, F., & Hawthorne, T. L. (2016). Transforming green walls into green places: Black middle class boundary work, multidirectional miscommunication and greenspace accessibility in southwest Atlanta. *Geoforum*, *77*, 17–27.

Sage, A. H., Hillis, V., Graves, R. A., Burnham, M., & Carter, N. H. (2022). Paths of coexistence: Spatially predicting acceptance of grizzly bears along key movement corridors. *Biological Conservation*, *266*, 109468.

Sakurai, R., Jacobson, S. K., & Ueda, G. (2013). Public perceptions of risk and government performance regarding bear management in Japan. *Ursus*, *24*, 70–82.

Schell, C. J., Dyson, K., Fuentes, T. L., Des Roches, S., Harris, N. C., Miller, D. S., Woelfle-Erskine, C. A., & Lambert, M. R. (2020). The ecological and evolutionary consequences of systemic racism in urban environments. *Science*, *369*, 4497.

Schell, C. J., Stanton, L. A., Young, J. K., Angeloni, L. M., Lambert, J. E., Breck, S. W., & Murray, M. H. (2021). The evolutionary consequences of human–wildlife conflict in cities. *Evolutionary Applications*, *14*, 178–197.

Seto, K. C., & Satterthwaite, D. (2010). Interactions between urbanization and global environmental change. *Current Opinion in Environmental Sustainability*, *2*, 127–128.

Skupien, G. M., Andrews, K. M., & Larson, L. R. (2016). Teaching tolerance? Effects of conservation education programs on wildlife acceptance capacity for the American alligator. *Human Dimensions of Wildlife*, *21*, 264–279.

Slagle, K., & Bruskotter, J. T. (2019). Tolerance for wildlife: A psychological perspective. In B. Frank, J. A. Glikman, & S. Marchini (Eds.), *Human wildlife interactions: Turning conflict into coexistence* (pp. 1–19). Cambridge University Press.

Slagle, K. M., Bruskotter, J. T., & Wilson, R. S. (2012). The role of affect in public support and opposition to wolf management. *Human Dimensions of Wildlife*, *17*, 44–57.

Soulsbury, C. D., & White, P. C. (2015). Human–wildlife interactions in urban areas: A review of conflicts, benefits and opportunities. *Wildlife Research*, *42*, 541–553.

Sterba, J. (2012). *Nature wars: The incredible story of how wildlife comebacks turned backyards into battlegrounds*. Crown Publishing.

Strait, J. B., & Gong, G. (2015). The impact of increased diversity on the residential landscape of a sunbelt metropolis: Racial and ethnic segregation across the Atlanta metropolitan region, 1990–2010. *Southeastern Geographer*, *55*, 119–142.

Teel, T. L., Manfredo, M. J., Jensen, F. S., Buijs, A. E., Fischer, A., Riepe, C., Arlinghaus, R., & Jacobs, M. H. (2010). Understanding the cognitive basis for human-wildlife relationships as a key to successful protected-area management. *International Journal of Sociology*, *40*, 104–123.

United Nations, Department of Economic and Social Affairs, Population Division. (2019). World Urbanization Prospects 2018: Highlights (ST/ESA/SER.A/421). https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/files/documents/2020/Feb/un_2018_wup_highlights.pdf

U.S. Census Bureau. (2020). *Census of population and housing. Decennial census by decades*. https://data.census.gov/

Van Velsor, S. W., & Nilon, C. H. (2006). A qualitative investigation of the urban African-American and Latino adolescent experience with wildlife. *Human Dimensions of Wildlife*, *11*, 359–370.

Vaske, J. J., Roemer, J. M., & Taylor, J. G. (2013). Situational and emotional influences on the acceptability of wolf management actions in the Greater Yellowstone Ecosystem. *Wildlife Society Bulletin*, *37*, 122–128.

Wald, D. M., & Jacobson, S. K. (2013). Factors affecting student tolerance for free-roaming cats. *Human Dimensions of Wildlife*, *18*, 263–278.

Wu, J. (2014). Urban ecology and sustainability: The state-of-the-science and future directions. *Landscape and Urban Planning*, *125*, 209–221.

Zajac, R. M., Bruskotter, J. T., Wilson, R. S., & Prange, S. (2012). Learning to live with black bears: A psychological model of acceptance. *Journal of Wildlife Management*, *76*, 1331–1340.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Data S1: Survey instrument: Understanding people's opinions of wildlife in urban and residential areas.

Table S1: Demographic and socio-economic characteristics of survey respondents, metropolitan Atlanta, United States, January–April 2022 ($n = 1006$).

Table S2: Number of respondents who interacted with wildlife, including type of human–wildlife interactions and the wildlife with which respondents have interacted, metropolitan Atlanta, United States, 2022.

Table S3: Respondents' attitudes towards wildlife, metropolitan Atlanta, United States, January–April 2022 ($n = 1006$).

Table S4: Respondents' emotions towards wildlife, metropolitan Atlanta, United States, January–April 2022.

Table S5: Respondent' self-efficacy pertaining to managing interactions with wildlife, metropolitan Atlanta, United States, January–April 2022.

Table S6: Respondent' trust in the Georgia Department of Natural Resources to manage wildlife and human–wildlife conflicts, metropolitan Atlanta, United States, January–April 2022 ($n = 1006$).

Table S7: Distribution of responses to the Wildlife Value Orientation Scale ($n = 1006$). These statements loaded onto three factors: mutualism; hunting beliefs; and utilitarian views of wildlife.

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