

Urbanization and Behavioral Shifts in Wildlife: Adaptation Strategies of Birds and Mammals in Human-Dominated Landscapes

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Abstract: Rapid urbanization has significantly transformed natural ecosystems, compelling wildlife species to adapt their behaviors in order to survive in human-dominated environments. This study examines the behavioral adaptations of urban wildlife, particularly birds and mammals, in response to changing ecological conditions such as habitat fragmentation, artificial light, noise pollution, human activity, and alternative food sources. Focusing on species including pigeons, raccoons, mice, and urban deer, the research analyzes modifications in feeding habits, nesting patterns, migration routes, and social interactions within urban landscapes. Drawing upon ecological and behavioral studies, the paper explores how some species successfully exploit urban resources while others struggle to adapt, leading to changes in biodiversity and ecosystem balance. The study also investigates the broader ecological implications of these adaptations, including altered predator-prey relationships and increasing human-wildlife encounters. By highlighting the resilience and limitations of urban wildlife, this research contributes to contemporary discussions on urban ecology, biodiversity conservation, and sustainable city planning. Ultimately, the paper argues that understanding wildlife behavioral adaptation is essential for promoting coexistence between humans and animals in rapidly expanding urban spaces.

Keywords: Artificial Light, Noise Pollution, Human Activity, Habitat Fragmentation

1. Introduction

9.8 billion People will inhabit the planet by 2050, with three billion of them living in rural regions and nearly seven billion in urban areas (~7/10 billion), according to Ritchie and Roser (2018). In 2021, 81% (31,877,892) of population of Canada already resided in "urban" regions, which the government defines as places with 1000 or more people. In order to meet human requirements, urban ecosystems were developed since the majority of people live in cities[1-7]. This has an impact on the biodiversity that formerly called these areas home. No more wild things exist. Is nature still seen as existing outside of cities or people? In the urban jungle, are certain species and locations allowed to exist while others are not?

According to John Fraser, the effects of urbanization are felt both near and far from the location of urban expansion in ecological systems, which are biological groupings of interacting species and their physical environs. Throughout the previous century, there have been changes to the environment, such as the construction of skyscrapers, more daytime human activity, and roads that obstruct wildlife's normal migration corridors (or linking paths). According to Kobilinsky (2020) and Bonnet-Lebrun, Manica, and Rodrigues (2020), certain species cease going to far-off locations because of wetlands, rising temperatures, and alternative food sources like bird feeders and garbage cans in metropolitan areas. Bees are forced to travel farther due to the loss and fragmentation of urban habitat[8]. Which can have a negative impact on species biodiversity because fewer pollinating plants are available. To go from their grazing and breeding grounds, mule deer have to stride hazardous highways or inter linked roads. In



Virginia's Eliza-beth River, killifish that are more tolerant of poisonous water have proliferated besides this, their minimum tolerant homogenous have perished[9]. Pigeons nest in tall construction buildings and consume human waste, but mice and racoons (Procyon) have developed better immune systems to withstand relatively crowded living situations. Even if certain species have adapted to thrive in urban environments, ecosystem biodiversity is a different issue[10-14].

Rich biodiversity has a favorable effect on human mental health as well as the physiological well-being of humans and fauna. According to Gunnarsson 2016; the city's true biodiversity—rather than its perceived biodiversity—influences positive aesthetic assessments of green spaces. In other words, more people want to visit places with greater biodiversity, this may result in increased physical activity and, consequently, improved physical and mental health in urban environments.

Additionally, it was proposed by Gunnarsson et al. (2016) that thoughts about green areas were influenced by "high" (i.e., positive value) environmental sentiments. Tolerance for unpleasant encounters with animals is one of several additional characteristics that may potentially impact these attitudes toward the environment. Just three Even if you have a strong environmental viewpoint, it does not mean that you will like spending time with wildlife. One's opinions and even conduct toward animals may be influenced by experiences with certain species. According to few researchs, unfavorable opinions about wildlife result in more aggressive actions toward them, whereas other studies have demonstrated a very minimal correlation between attitudes and behavior toward wildlife[15].

The events that led to these negative feelings might be the cause of an increase in violence. According to Shumway et al. (2014), these discrepancies in research findings may be explained by imagined experiences rather than real harmful occurrences, such as one's perceived level of threat. Furthermore, one's emotional reaction and tolerance are greatly influenced by the event itself[16-17]. Do brief interactions have an impact on people's attitudes? Will someone who observes bird droppings while strolling through a park, for instance, be less inclined to hate birds? Will children quit going to the park if their interest in birds' wanes?

Human behavior typically varies according on the social setting, indicating that people are not as stable as they may think. Consistency, according to Kowalski and Westen (2009), is the capacity of an individual to respond to the same stimuli in a consistent manner throughout time. The link that a person forms across a behavior, an object, and an assessment of the act and/or object may also be used to characterize their attitude. According to Carley (2014), one should be predictable conduct focused on one's behavior because there are a number of contextual and dispositional elements that may impact behavior. Some contend that conduct changes along with ideas, becoming unexpected in various contexts depending on how the environment's effect shifts. Persuasion, which is the conscious effort to alter one's attitude, is one way these four attitudes may vary based on the circumstances[18].

Attitude is a succinct and straightforward evaluation that influences thoughts and actions for the purposes of this research. Attitude is a complex idea with behavioral, emotional, and cognitive components, claim Balram and Dragicevic (2005). Some have explored animal tolerance in particular, based on respondents' encounters with animals and how wildlife-related their community is. The Dispositional Empathy (DENS) with Nature Relatedness Scale (NR) are two previous tools for measuring animal sentiments.

Each size has a distinct perspective on the "connection" between humans and nature. While some have referred to this relationship with animals as "human-nature interaction," others

have used the term "eco-connection". Despite having distinct lexicons, both concepts have contributed a similar dimensionality to the primary term[19].

According to Lomas (2019), eco-connection encompasses three elements of an individual's relationship with nature: appreciation, connection, and sacrifice. The phenomenon when nature is viewed as "other" and exceptional is called sacrality. At that point, nature turns into something other from oneself, forbidden, or unknown. The term "bonding" represents to the different methods that humans interact with environment on a physical, sensory, cognitive, emotional, philosophical, and spiritual level, with a focus on the interaction between humans and environment. Those who actively value and engage with nature are seen as appreciative. While it can exist outside of the first two dimensions, spending time in nature and observing its subtleties is an activity that penetrates them[20].

Researching eco-connection is essential to generating new ideas, debates, and conversations about the interaction between people and the natural world, claims Lomas (2019). According to Lomas (2019), these programs can increase wellness literacy, which is defined as "the vocabulary, know-ledge, and skills that may be intentionally used to maintain or improve the wellbeing of oneself or others." Numerous research has looked at wellbeing and their literacy in city regions as a result of the previously stated population urbanization, and they have connected these aspects to the city region parks quality[21].

When someone is physically near nature or immediately encounters a natural stimulation, they are said to have a human-nature connection. Soga & Gaston are proposed a list five which attributes of this concept: intentionality, immediateness, consciousness, degree of people intervention, and pivot of consequences. The degree of physical closeness to nature is known as immediateness. While less immediate connections may not necessitate physical presence (e.g., taking in a window view of nature because of residential proximity), being actively involved in nature (e.g., strolling in a field) facilitates more direct encounters[22].

A person's level of awareness is determined by how much they actively notice and monitor the natural environment around them, or how much they are aware that they are interacting with nature. The degree to which a person consciously interacts with nature—for example, by going to a park or urban green space—is known as intentionality. Examples of human mediation are situations or locations that have been impacted by human activity. Observing animals from a distance would need less human-mediated interaction than monitoring and identifying birds in a metropolitan park. Both the natural and human perspectives can be used to examine the direction of results. Positive consequences would, from a human perspective, lead to better health and a greater appreciation of wildlife, notwithstanding unpleasant animal interactions[23]. Later in my thesis, I will revisit these topics and incorporate them into my methodology.

Urban animal cohabitation may be defined by human-nature connections (which include all five expectations) or eco-connections (which include bonding and adoration). Certain measures, such as the DENS, concentrate on how representative an individual's perceptions of themselves and their nature are, along with any emotions they may have associated with it. Other assessments, like the Love and Care for Nature Scale and the NR6, concentrate on a person's sentiments and the ways in which they engage with the natural world. A person's ability to deal with problematic animals has also been measured using scales. Some of these issues have been minor, such noise-induced disruptions, while others have been major, like property damage. These scales do not cover the 5 pivots of human behavior for interaction outlined by Soga and Gaston (2020), despite the fact that they are frequently employed to comprehend some elements

of interconnection in surroundings[24].

2. Literature Survey

When Shumway et al. (2014) examined villagers' attitudes toward wildlife, they discovered that there was a regional component associated with species and coexistence space preferences. For instance, Shumway et al. (2014) discovered that participant views on koala conservation varied according to the level of urbanization in their area. Residents in the suburbs were less inclined to support koala conservation and take action. This spatial component would fall within the immediateness category of an encounter, according to Soga and Gaston (2020).

To put it another way, those who live closer to an intact environment and the species that naturally occupy it have more favorable sentiments about that species (i.e., the less urban the place you live in). Hariohay et al. (2018) assert that a better understanding of local attitudes is essential for the future of animal protection. In contrast to Shumway et al. (2014), Hariohay et al. (2018) found that the closer a person lived to a protected area (PA), the more negatively they perceived local animals.

The main reason why the locals felt negatively was because of the harm or danger that wildlife posed to their crops or animals. What do these contradictory findings imply? Urban landscapes must be designed to promote constructive interactions between human and nonhuman actors if people want to develop ecosystems that support conservation. Miller and Hobbs (2002) emphasized that in order to communicate biodiversity in a way that would be favorably received, conservation initiatives must be included in-to people's everyday lives.

Given that our "urban selves"—that is, people who live in urban environments—have "nature needs," Rupprecht (2017) contends that the opportunity to interact with their natural environment must be provided. To what extent do views and knowledge about animals influence human behavior? Additionally, interactions with the environment may change when consciousness is influenced by positive associations. Similar to this, unfavorable perceptions brought on by animals causing property damage can worsen human conduct and occasionally result in the depletion of resources found in nature[25].

Eriksson et al. (2015) discovered a connection between individual experiences with wildlife and acceptance of it in both urban and rural settings. People's opinions and tolerance of geese are influenced by a variety of factors, including differences in municipality, socio demographics, encounters with animals, and psychological processes. In Chapters 3–5, I examine these spatial and demographic disparities. In order to prevent unpleasant or problematic interactions, urban planners must exercise caution while constructing parks and green areas, as acceptability is contingent upon the closeness and overall exposure to animals. It is necessary to first understand local views on wildlife in order to design contemporary urban spaces that best meet human needs and animal migrations in urban areas[25-28].

3. Methodology

Ethics approval was received from the University of Lethbridge (2020-014) and Lethbridge College (LC-20-24) for the 2020 season[29].

By going door-to-door and handing out flyers encouraging residents of Lethbridge to take part in an online questionnaire administered by in the summer of the year 2020, investigators used a University of Lethbridge Qualtrics monitoring system to gather public feedback. Covers and sanitation protocols were followed, and I had to modify my health precautions to comply with COVID-19's distance from society guidelines. In order to get a moderate result from the approaches employed, I projected a participation rate of close to 10-15% out of a total of 300 participants, with around 50 coming from each of the city's six regions[30-32].

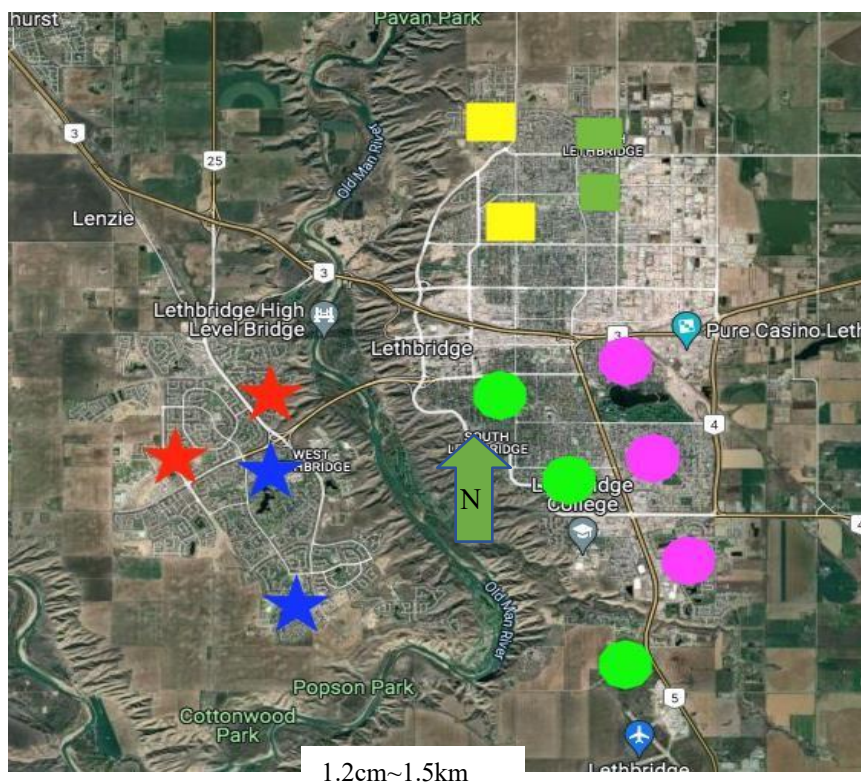


Figure 1: Check out the City of Lethbridge's geographical area map

Fig. 1 Check out the City of Lethbridge's geographical area map here. The six portions that made up the study area were each identified by a rectangular shape for its borders and a different color. The red area is the North Westside. Westside South is blue. It's dark green on the western side of North side. The eastern part is yellow on its northern side. In Southside, the west side is light green. It's violet on the east edge of the Southside[33-35].

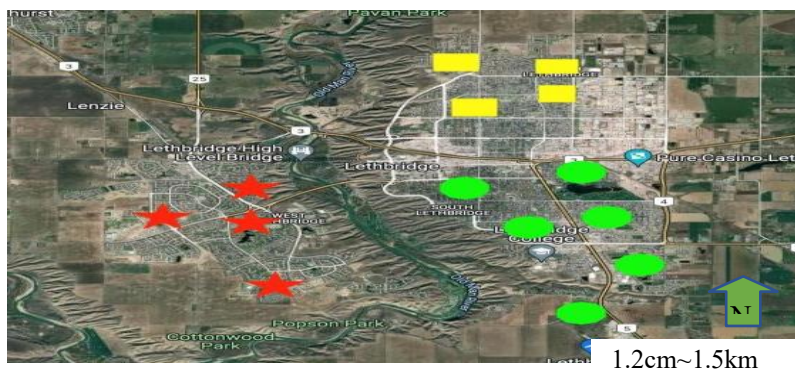


Figure 2: The geographic area map of the metropolitan area of Lethbridge

Fig. 2 The geographic area map of the metropolitan area of Lethbridge is displayed Every of the three distinct regions that made up the research site was given a certain color. Westside is red. It is golden up northern. The color is greenish on the south side.

The city was surveyed on foot in several areas (Fig. 3). There were two requests for these territories, one week apart. The location and population of each of the six regions (Figure 1) were taken into consideration while choosing apartment complexes. I sent items to residences via Canada Post (about 1500 fliers). The weekly door-to-door campaign consisted of about 1500 fliers distributed every Tuesday through Thursday. After talking with Canada Post about the most advantageous and worse periods to send out fliers, currently were selected. Other methods of recruiting included print advertisements on radio and online[36-37].

Nearly 3,000 residences were inspected in all. Data was gathered using a web-based questionnaire on the Qualtrics has website and an encrypted database. Every file has been backed up to the servers of Lethbridge College and the institution of Lethbridge (N 1.2 cm ~ 1.5km). The measuring instruments were the Natural connection short questionnaire (NR6) for reliability evaluation and a streamlined and modified edition of the UWCAS (the results on the UWCAS were an estimated mean lowest value of 0 and a highest rating of 5).

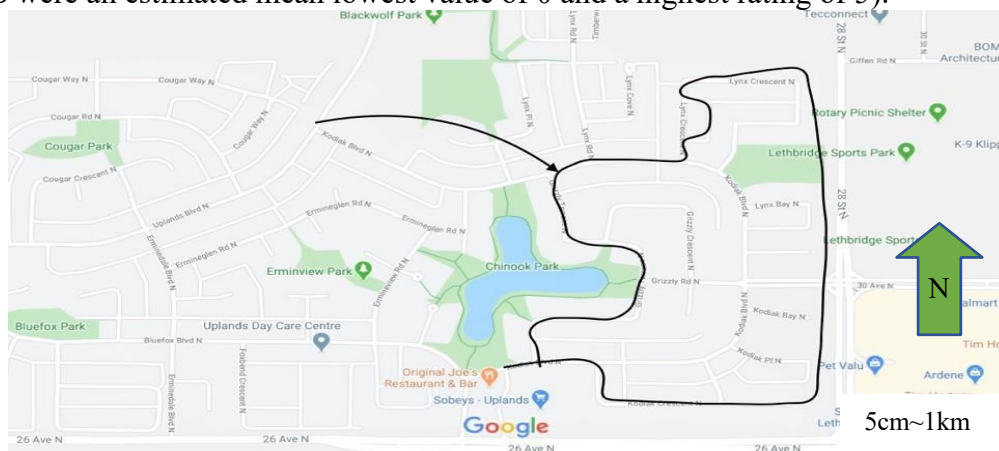


Figure 3: Approximately 100 flyers were delivered along the flyer distribution route (black) to every odd-numbered residence in the area

4. Results and Discussion

The findings revealed that urban residents generally held positive attitudes toward wildlife and urban biodiversity, although tolerance varied according to species type and perceived risk. Deer were the most preferred animals across Calgary, Red Deer, and Lethbridge because respondents associated them with enjoyment, beauty, and opportunities for observation. Birds, rabbits, and squirrels were also viewed favorably for similar reasons. In contrast, skunks and coyotes were among the least preferred species due to concerns about smell, danger, aggression, and property damage. These results suggest that public tolerance toward urban wildlife is strongly influenced by the balance between aesthetic enjoyment and perceived threat. Participants were more willing to coexist with species that contributed positively to recreational or emotional experiences, while animals associated with fear or nuisance generated negative reactions.

Similar trends emerged regarding plant preferences. Native and visually attractive plants such as roses and saskatoon berries were highly favored because respondents considered them beautiful and beneficial for pollinators and wildlife. Conversely, invasive plants such as thistles and dandelions were disliked due to their association with weeds and environmental degradation. Overall, more positive than negative responses were recorded for both flora and fauna, supporting previous research suggesting that urban residents generally maintain favorable

perceptions of nature. These findings demonstrate the importance of integrating attractive native vegetation and visible wildlife habitats into urban planning to improve both biodiversity conservation and public engagement with urban ecosystems.

5. Conclusion

This study demonstrates that urban residents generally value biodiversity and maintain positive attitudes toward many forms of wildlife and native vegetation. However, tolerance depends largely on how species are perceived in terms of safety, beauty, usefulness, and impact on property. Animals such as deer and birds were appreciated for their aesthetic and recreational value, whereas skunks and coyotes generated concern because of perceived threats and nuisance behaviors. Similarly, native flowering plants were preferred over invasive species due to their ecological and visual benefits. These findings highlight the importance of understanding public perceptions when designing urban conservation policies and biodiversity management strategies.

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References

- [1] I. Adam, "Tourists' perception of beach litter and willingness to participate in beach clean-up," *Marine Pollution Bulletin*, vol. 170, 2021.
- [2] A. C. Ayers and S. M. Rehan, "Supporting bees in cities: How bees are influenced by local and landscape features," *Insects (Basel, Switzerland)*, vol. 12, no. 2, pp. 128, 2021.
- [3] A. Baddeley, M. W. Eysenck and M. C. Anderson, "Motivated forgetting. Memory 2nd Edition, (p. 266). New York, NY: Psychology Press Baglin, J. (2014). Improving your exploratory factor analysis for ordinal data: A demonstration using FACTOR," *Practical Assessment, Research & Evaluation*, vol. 19, no. 5, pp.1-15, 2015.
- [4] S. Balram and S. Dragicevic, "Attitudes toward urban green spaces: integrating questionnaire survey and collaborative GIS techniques to improve attitude measures," *Landscape and Urban Planning*, vol. 71, pp.147-162, 2005.
- [5] D. Bandalos, "Measurement Theory and Applications for the Social Sciences," *Guilford Press*, 2018.
- [6] M. T. Barendse, F. J. Oort and M. E. Timmerman, "Using exploratory factor analysis to determine the dimensionality of discrete responses," *Structural Equation Modeling*, vol. 22, no. 1, pp. 87-101, 2015.
- [7] S. Baruch-Mordo, S. W. Breck, K. R. Wilson and J. Broderick, "A toolbox half full: How social science can help solve human-wildlife conflict," *Human Dimensions of Wildlife*, vol. 14, no. 3, pp. 219-223, 2009.
- [8] M. Bateson, L. Callow, J. R. Holmes, M. L. Redmond Roche and D. Nettle, "Do images of 'watching eyes' induce behaviour that is more pro-social or more normative? A field experiment on littering," *PloS One*, vol. 8, no. 12, pp. e82055, 2013.
- [9] C. D. Batson, "The altruism question: Toward a social-psychological answer," *Hillsdale, NJ: Erlbaum*, 1991.
- [10] J. Bernstein and B. W. Szuster, "The new environmental paradigm scale: Reassessing the operationalization of contemporary environmentalism," *The Journal of Environmental Education*, vol. 50, no. 2, pp. 73-83, 2018.
- [11] S. Bode, C. Murawski, C. S. Soon, P. Bode, J. Stahl and P. L. Smith, "Demystifying free will: The role of contextual information and evidence accumulation for predictive 99 brain

- activity," *Neuroscience and Biobehavioral Reviews*, vol. 47, pp. 636- 645, 2014.
- [12] A. Bonnet-Lebrun, A. Manica and A. S. L. Rodrigues, "Effects of urbanization on bird migration," *Biological Conservation*, vol. 244, no. 108423, 2020.
- [13] S. Braaker, J. Ghazoul, M. K. Obrist and M. Moretti, "Habitat connectivity shapes urban arthropod communities: The key role of green roofs," *Ecology (Durham)*, vol. 95, no. 4, pp. 1010-1021, 2014.
- [14] G. N. Bratman, J. P. Hamilton, K. S. Hahn, G. C. Daily and J. J. Gross, "Nature experience reduces rumination and sub-genal prefrontal cortex activation," *PNAS*, vol. 112, no. 28, pp. 8567–72, 2015.
- [15] G. T. L. Brown, "Measuring attitude with positively packed self-report ratings: Comparison of agreement and frequency scales," *Psychological Reports*, vol. 94, no. 3, pp. 1015-1024, 2004
- [16] G. Brown, M. F. Schebella and D. Weber, "Using participatory GIS to measure physical activity and urban park benefits," *Landscape and Urban Planning*, Vol. 121, pp. 34–44, 2014.
- [17] R. Buckley, "Nature tourism and mental health: Parks, happiness, and causation," *Journal of Sustainable Tourism*, vol. 28, no. 9, pp. 1409-1424, 2020.
- [18] A. E. Buijs and M. H. Jacobs, "Avoiding negativity bias: Towards a positive psychology of human–wildlife relationships," *Ambio*, vol. 50, no. 2, pp. 281-288, 2021.
- [19] T. Byrt, J. Bishop and J. B. Carlin, "Bias, prevalence, and kappa," *Journal of Clinical Epidemiology*, vol. 46, no. 5, pp. 423 – 429, 1993.
- [20] R. W. F. Cameron, P. Brindley, M. Mears, K. McEwan, F. Ferguson, D. Sheffield, A. Jorgensen, J. Riley, J. Goodrick, L. Ballard and M. Richardson, "Where the wild things are! Do urban green spaces with greater avian biodiversity promote more positive emotions in humans," *Urban Ecosystems*, vol. 23, no. 2, pp. 301-317, 2020.
- [21] V. Campbell-Arvai, "Engaging urban nature: improving our understanding of public perceptions of the role of biodiversity in cities," *Urban Ecosyst*, vol. 22, pp.409–423, 2019.
- [22] R. M. Campbell, T. J. Venn and N. M. Anderson, "Cost and performance tradeoffs between mail and internet survey modes in a nonmarket valuation study," *Journal of Environmental Management*, vol. 210, pp.316-327, 2018.
- [23] Canada Urban Population 1960-2021. (2021). Macrotrends Retrieved from <https://www.macrotrends.net/countries/CAN/canada/rural-population>
- [24] K. E. Charles and W. Linklater, "The role of environmental engagement in tolerating urban bird problems," *Human Dimensions of Wildlife*, vol. 20, no. 2, pp. 99-111, 2015.
- [25] S. Y. Chyung, D. Hutchinson and J. A. Shamsy, "Evidence - Based survey design: Ceiling effects associated with response scales," *Performance Improvement (International Society for Performance Improvement)*, vol. 59, no. 6, pp. 6-13, 2020.
- [26] S. Cloutier, J. Jambeck and N. Scott, "The sustainable neighborhoods for happiness index (SNHI): A metric for assessing a community's sustainability and potential influence on happiness," *Ecological Indicators*, vol. 40, pp.147-152, 2014.
- [27] M. Dallimer, K. N. Irvine, A.M. J. Skinner, Z. G. Davies, J. R. Rouquette, L. L. Maltby, P. H. Warren, P. R. Armsworth and K. J. Gaston, "Biodiversity and the feel-good factor: Understanding associations between self-reported human well-being and species richness," *BioScience*, vol. 62, no.1, pp. 47-55, 2021.
- [28] E. D. De Leeuw, "Data quality in mail, telephone, and face to face surveys," *TT-Publikaties, Amsterdam*, 1992.
- [29] Z. Dienes and N. Mclatchie, "Four reasons to prefer Bayesian analyses over significance testing," *Psychon Bull Rev*, 25, 207-218, 2017.
- [30] I. Douven, "A bayesian perspective on likert scales and central tendency," *Psychonomic Bulletin*

&Review, vol. 25, no. 3, pp.1203-1211, 2018.

- [31] M. Egerer and S. Buchholz, "Reframing urban "wildlife" to promote inclusive conservation science and practice," *Biodiversity and Conservation*, vol. 30, 2021.
- [32] M. Ernest-Jones, D. Nettle and M. Bateson, "Effects of eye images on everyday cooperative behavior: A field experiment," *Evolution and Human Behavior*, vol. 32, no. 3, pp.172-178, 2011.
- [33] M. Eriksson, C. Sandström and G. Ericsson, "Direct experience and attitude change towards bears and wolves," *Wildlife Biology*, vol. 21, no. 3, pp. 131-137, 2015.
- [34] L. Eriksson, M. Johansson, J. Månsson, S. Redpath, C. Sandström and J. Elmberg, "The public and geese: a conflict on the rise," *Human Dimensions of Wildlife*, vol. 25, no. 5, pp. 421-437, 2020.
- [35] A. Folmer, T. Haartsen and P. P. P. Huigen, "How ordinary wildlife makes local green places special," *Landscape Research*, vol. 44, no. 4, pp. 393-403,2019.