

Embracing Coexistence:

*urban design strategies for creating
wildlife-friendly cities.*

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Abstract

Cities are especially important for human development; it is where people live, build communities, work, learn, and thrive. In cities, human and technological development coincide. But, while building urban and increasingly dense spaces for people's comfort, other beings are in effect forced to adapt to the ever-growing and changing human habitats. Additionally, major challenges such as climate change resulting in wildfires, flooding, and extreme weather conditions are forcing wild animals and invertebrates to shift closer, if not entirely into human occupied areas. The intense urban densification of the world has affected non-human beings that used to roam freely in those unoccupied areas. Some animals are permanently displaced, while others have successfully adapted to the new human centric environment. Even though wild animals have been able to adapt, cities have not been designed for them, which complicates the way in which they can survive, even as they evolve to co-exist with human urbanites.

With an *inclusive design approach*, this project recognizes both the differences and similarities between human inhabitants and 'urbanized' wild animals, as part of having a better understanding to improve the coexistence of species within an urban context. It examines and outlines a range of contemporary initiatives that have been developed and proposed with a focus on designing for animals. The project also gathers information from interviews with experts in wild animal welfare, animal ethics, and sustainable urban planning. In addition to the interviews, data is also collected from an anonymous survey open to people that lives in Toronto.

As a result of the research, initial guidelines are proposed to either design new cities or adapt existing urban centres with a more inclusive strategy. These guidelines are organized in three principal areas: *infrastructure and planning*, *government policies and community involvement*, and *biodiversity conservation and animal welfare*. While the project concludes with proposed guidelines, it is understood that it is just an initial stage, and that the journey to have animals, nature, and human beings successfully co-exist in urban centres is an ongoing project in constant adaptation to the rapid and significant changes we are seeing in the environment today.

Key words: Inclusive Design, Animal Inclusion, Wild Urban Animals, Sustainable Urban Planning, Inclusive Cities, Urban Resilience

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Dedication

To every being (human and non-human) who has ever felt like they were displaced or that they did not belong.

May you find your community and have your uniqueness celebrated.

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1. Introduction

1.1. Personal Perspective

Peru is in the western area of Latin America. It is a country extraordinarily rich in culture, biodiversity, and natural resources. Due to its geography, it is divided in three regions: Coast, Highlands, and Jungle (Biofin, n.d.). The country is extraordinarily rich in diversity of flora and fauna throughout its regions and has been classified by the environmental news website *Mongabay* as the 5th country with the greatest biodiversity in the world (Butler, 2016). The National Geographic Magazine also recognized Peru as one of the ‘megadiverse’ countries on the planet (Peru Travel, 2023) noting all its biodiversity is located mostly in the jungle region.

However, significant areas of biodiversity are being threatened by mining among other invasive or harmful human development and resource extraction practices as part of expanding and rampant capitalism. Many native communities and cities located in different provinces of Peru are facing conflicts with private companies that are looking to exploit the natural resources.

The high frequency of conflict that accompanies extractive activities, the growing deforestation of the Amazon rainforest, and recurring water scarcity due to climate change are just some examples of the multiplicity of challenges that the Andean-Amazonian region faces in achieving the Sustainable Development Goals (SDGs). (GRADE, 2025).

While these conflicts between cultures and worldviews arise, the environment (as well as human beings and animals) are tremendously affected. Water is being polluted, trees are being clear cut from the forests, and the habitats of diverse animals are being destroyed.



Figure 1: Peruvian Map

Note: Image taken from Torres-Roman *et al.*, 2020
https://www.researchgate.net/publication/346570752_Breast_cancer_mortality_trends_in_Peruvian_women#fullTextFileContent

In addition to the problems that affect natural resources, biodiversity cannot be found easily in major cities of Peru. The provincial areas are so urbanized that one can barely find common urban life such as pigeons and stray dogs and stray cats. These cities are not designed to benefit their natural resources. Some cities around the world aim to design their parks with native plants, whereas in Peru, most of the parks in urban centres are designed just to look aesthetic and beautiful without thinking of long-term care required in an era of climatic change, or whether or not the design can benefit both human city dwellers and wildlife in the surrounding area.

Of note is that Peru –and especially Lima– is the home of the concept of ‘*informal expansion*.’ This term is used to refer to the areas where houses are built informally by people who migrate to the capital. Massive migration causes a lack of housing, so migrants opted to select a land and build their houses without any regulation and without proper materials.

In Peru, the increment in population is mainly observed in urban areas, which is a consequence of the massive migration from rural to urban areas during the second half of the 20th century. As the large demand of housing has not been satisfied, informal settlements have become the main mode of urban growth. (Moya *et al.*, 2024, p. 1).

The urban population in Lima has increased significantly in the last 50 years and one of the main reasons for this is centralism; Lima is not only the capital of the country but it is also considered to be the most important city in the country, which is why many people from other provinces (and lately, neighbouring countries) migrate to the city looking for new opportunities. This migration is a major problem because there is no formal planning to take in additional residents resulting in an informal expansion of the capital city. “This accelerated urban expansion has occurred mainly through the informal, unplanned occupation of the territory—which has generated cities where vast areas do not have adequate access to basic services, public spaces, urban infrastructure, and economic opportunities in general.” (GRADE, 2025).



Figure 2: Peruvian informal expansion

Note: Picture credit to Rolly Reyna as mentioned by Giese Salazar (2021).

Source:

https://elcomercio.pe/eldomical/opinion-que-hacer-con-el-tema-de-la-vivienda-en-el-peru-urbanismo-lima-noticia/#google_vignette

Lima as the largest city in Peru and the most urbanized, both formally and informally, has little room for biodiversity within the metropolitan area, and unfortunately a key aspect of nature is to be barely noticeable within the expanding boundaries, unlike other urban centres in South America and elsewhere.

As a Lima born citizen, coming to the GTA and Canada informs the research interest I have for greater inclusive urbanization and fuels the project scope for this master’s work. In my Lima neighbourhood the only beings (besides humans) that can be found are a few pets, or pigeons, leaving a gap in human-animal interaction and co-existence, which can be found in many urban places around the world. It is in this context that the idea for this MRP project came to mind. Anecdotally, as I was working at my desk in Lima one day, a sudden movement outside

my window made me turn my head to look and there I saw a squirrel on the power lines. This surprised me as it was not common to see squirrels in the area, but at the same time it made me feel a sadness because I realized that animals that live in urban settings are the ones who have had to adapt throughout time to the major and often debilitating changes humans have made to the natural environment. I attributed this issue to unfettered urbanization and that idea was reaffirmed when I moved to Toronto and immediately noticed it is more common to see more wild animals in the city's surrounding areas (the suburbs) in comparison to the urban centre (Downtown).

Lastly, I came across an image on social media (see **Figure 3**) that reminded me that, in the near past, animals were also part of the land that humans now inhabit, that was also their habitat and that we have displaced them by creating a more urbanized area for us and stolen them their rightful land. Which reinforced my questioning on why it is always the animals that adapt to us, I think humans should also adapt to animals and nature and include them in our context. Humans have always tried to displace as many animals as possible to avoid confrontations with them and to create a human-centered space.

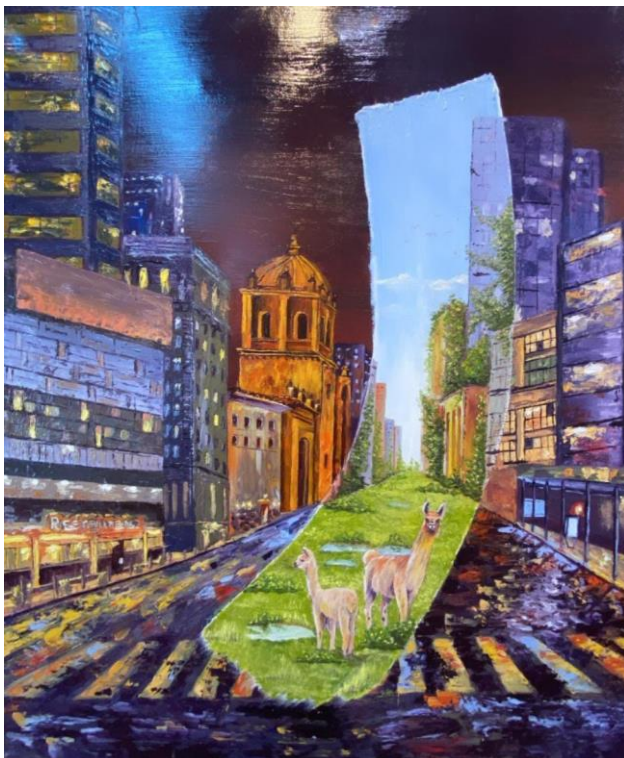


Figure 3: How animals used to inhabit urban areas

Note: Image found in social media shared by a contact of the student researcher without attribution to the author. Source: Unknown author, n.d.

1.2. Inclusive Design

After the Industrial Revolution changed the production of goods from handcrafted to machine-manufactured, the products were manufactured in mass. “(...) the Industrial Revolution in Great Britain in the mid 18th century that (...) changed the way things were made. This revolution marked the transition to new manufacturing processes. It transformed hand production to machines, introduced new processes, and increased production power.” (MAKO, 2017). The change brought some issues with it, such as the loss of tailor-made objects, which were replaced by mass production of the same design and the same parameters for every user creating a problem for people who do not fit in the “average.” It is in this context that inclusive design was created, the idea of a practice that allowed products to understand and celebrate the differences of the users. “Inclusive design is design that considers the full range of human diversity with respect to ability, language, culture, gender, age, and other forms of human difference.” (IDRC, n.d.).

However, the importance of inclusion in design transcended the design of only objects, and it can be applied to many different practices such as industrial design, architecture, user experience (UX) design, user interface (UI) design, and even policy design, among others. When referring to inclusive design, not only are we talking about the inclusion of people with disabilities, but we also mean the inclusion of people with different social backgrounds, inclusion of communities, gender inclusion, and other aspects that differentiate them from what is socially considered “the average” The Inclusive Design Research Centre (IDRC) (n.d.) lists three dimensions of inclusive design:

- 1) Recognize diversity and uniqueness: inclusive design understands that every individual has their uniqueness, and that the world is filled with diversity, which is why a world designed for the average does not work but creates segregation that is not sustainable socially. Therefore, a proper design that is inclusive of these unique characteristics must be able to adapt to diverse needs and requirements. “The optimal inclusive design is best achieved through one-size-fit-one configurations or considerations within an integrated system.” (IDRC, n.d.).
- 2) Inclusive process and tools: To embrace this diversity in the process, designers not only have to acknowledge it but also use tools that are inclusive. One of these is codesign,

which includes the being that is usually marginalized in the creation process. “Inclusive design teams should be as diverse as possible and should include and be guided by the individuals that have difficulty or are excluded from the existing designs.” (IDRC, n.d.).

- 3) Broader beneficial impact: These changes in the system are not intended to be partial or ephemeral but instead are looking to have a broader and deeper change. “The goal is to trigger a virtuous cycle of inclusion by leveraging the innovation benefits of designing for needs at the margins.” (IDRC, n.d.).

Basing this project on the theory of inclusive design, it is aimed to recognize the difference of a community that is usually overseen but also needs to be included in the discussion: nature and animal inclusion. Humans are used to recognizing the needs their communities have but usually forget that there are other beings with similar needs with whom we share the world. The project intends to reduce the gap between humans and other beings by including them into the discussion with the hope to give a voice to beings that cannot speak.

1.3. Overview and Context

Throughout history, humankind has looked for ways to improve their way of living. First, by living in communities within caves, then by building tents, huts, and other shelter structures-built to ward off and protect against vicious wild animals. As communities grew, ways of living, hunting, engaging, trading, and bargaining developed and what was shelter expanded to form villages, towns, and then larger and larger cities. As Sjoberg mentions (1965), people started living in cities 5,500 years ago, but the proportion of the population concentrated in cities did not begin to significantly increase until 100 years ago.

With the construction of the individual shelter the concept of ownership and sanctity of a home aligned, and the idea that humans own a part of the land where they were the only ones who could choose what and where to build on it to the exclusion of other beings also gave rise to insecurities about what might ‘invade’ their occupied space. “Along with our first huts, we built a humancentric ecosystem. A system other animals wanted into and that we wanted to keep them out of.” (Brookshire, 2022). So not only people got a sense of ownership of the land but lived in it with a human centered approach.

People also decided that they could live their lives separate from animals and nature, even as they inhabited areas adjacent to natural landscapes, or cultivated within them- ‘the new

urbanite' could decide to build cities without caring if there were other beings that were affected by their decisions.

For most of the history of Western culture we have been told that we are separate from and above nature. That we own it, that we have dominion over it, that it is limitless and ours to use up as we see fit. (David & Reisman, 2021, p. 194).

As a result of the separation of nature and human-built development, the power of ownership and control meant that those beings immediate to their surroundings, and are not useful for their own benefit, would not be considered in the design of their spaces and communities. "(...) what counts as "wild nature" (...) is relatively far away and disconnected from their [human] daily lives" (Biehler & Cronon, 2013, p. 9).

Urbanization spread around the world without the consideration for including green and blue spaces in their development means that the design of cities is not particularly inclusive. As Roe & McCay (2021) state, an inclusive city has buildings and public areas that have been intentionally designed for access and to be used by all people. For this authors, an inclusive city brings difference and diversity into all stages of the design process. However, to talk about real inclusivity, its focus can not be only on humans, it should also be inclusive towards other beings, since they also share the broader territory and landscape with people.

The expansion of urban areas has also affected the world's natural biodiversity and ecosystems, planning and development approaches have seen little change in established guidelines to prevent or minimize the negative effects of urban growth and impingement on natural areas. More recently, conscientious and advanced urban communities are considering not only the effects of climatic change on urban centres, but also the impact it will have on wild animal populations and their well-being as part of human development. Natural resources have been affected by human settlement and expansion, including forests, waterways and systems, and even the quality of air. "The populations and economies of urban areas rely on hinterlands for resources, but there is a disconnect between using resources for urban areas and preserving or conserving ecosystem services that are outside of urban area." (Elmqvist *et al.*, 2013).

As Barlow (2013) mentions, there has been a misuse of water with agricultural processes and other human activities that contaminate the essential resource. Some communities, such as

Indigenous peoples, are victims of water theft, water contamination resulting in forcible displacement. “As big urban centres expand and look for new sources of water, they claim – *sometimes violently* – the water supplies of rural communities.” (Barlow, 2013, p. 48).

The resource crisis globally directly related to human activity has been recognized as a critical problem, but it has not been considered or acknowledged as an urgent matter or a priority for most people living, working in major urban centres. “(...) everyone around the planet is affected. This crisis may not be obvious in our daily lives, until a massive storm caused by the atmosphere’s warming smashes into our cities or until wildfires fill our skies with smoke.” (David & Reisman, 2021, p. 191). However, people must remember that the climate crisis affects every being, not only humankind. Adams (1994) defends that these actions have increased in history, but the process of habitat alteration and its effects on wildlife have not been recognized for a long time. The current time is seeing a confluence of environmental disasters with human made problems long in the making.

The only way to solve issues related to urban growth, and destruction of natural landscapes and habitats of wild animals is with a more holistic and inclusive approach, recognizing that humans are not the only beings or ecosystems that inhabit space and that cities need to be designed in a more sustainable way. Cities should be designed to be *life-centered* not human-centered, and in this way, more inclusive and respectful of all that rely upon the earth to thrive.

Life-centered design means that we understand our lives as a continuous flow of matter and energy in a never-ending cycle. Life-centered design is a Copernican shift in our way of life – a new narrative that breaks from the classical archetype of “man against nature.” Life-centered design is a culture of caring. (David & Reisman, 2021, p. 195).

Sustainable cities are a way to minimize the impacts of all human activities. Furthermore, the term *sustainability* cannot be used without mentioning other actors in nature, such as wild animals. “To preserve the biodiversity of our planet, we should promote a wildlife-friendly environment in the city while simultaneously working to protect the natural areas for those who cannot adapt to the man-made [*sic*] landscape.” (Wong, 2022).

Having areas in the city that are also designed specifically for migration, and habitation of wildlife is one wonderful way to be inclusive towards other beings. “A sustainable human-wildlife relationship would have active inclusion of wildlife in the conversation when the design decisions are being made. It would mean designing the urban environment while keeping wellness of the wildlife in mind.” (Shah, 2023, p. 30). It is the responsibility of humans to amend, or at least reduce, the damage they have done to nature and the range of biodiverse systems through urban expansion and other human activity.

1.4. The Problem

The conservation of natural resources is a topic of immense importance and should be a priority for humans. “Viable ecosystems are vital to both the health of humans and the planet.” (Nature Conservancy Canada, n.d.). Part of protecting nature is also taking care of wild animals and their habitats. The World Wildlife Fund (WWF) Canada (2022) mentions that the greatest threats to wildlife are:

1. **Pollution:** Ecosystems can be exposed to different pollutants, which affects plants and animals.
2. **Climate Change:** Drastic changes in the climate may make it difficult for several species to migrate to find food.
3. **Habitat Loss and Fragmentation:** Animals losing their habitats is one of the most common threats currently since it is getting more common globally, and animals must find new areas to inhabit to survive.
4. **Invasive Species:** Species that are not native to an area they are invading compete with the native ones and can even be predators.
5. **Unstable Harvest:** Unsustainable hunting, poaching, and bycatching are some of the practices that cause over-exploitation of wildlife.

Urbanization causes most of these problems and as stated before, the expansion of urban areas has affected animals and their natural habitats. This is not a problem that is going to be easily solved soon. Cities create pollution with cars, and gas emissions, and they contribute to deforestation leading to habitat loss among other consequences. “(...), urban areas have expanded enormously, now covering hundreds of square miles of land. And this expansion is by no means over; all predictions suggest that urban areas will continue to grow in size.” (Palmer ,

2003). As mentioned by Sarkar & Bhadra (2022), this is a form of “human-induced rapid environmental change,” also called as HIREC, and it brings both challenges and benefits.

The benefits of this HIREC are that even though some animals were “swallowed up” in this new urban context, they continued to live in the same area but opted to adapt to the presence of humans in the space and the changes they made (Palmer , 2003). These animals have learned to take advantage of the resources they can find in the cities: “(...) there are a wide variety of adaptations and evolutionary histories are at play in allowing some creatures to tap this amazing bounty of resources in our cities, while avoiding hazards including night light, chemical pollution and certainly automobiles.” (Alagona, 2022, as cited by Poon, 2022).

Furthermore, not only some species thrived in these urban environments, but these have also been the perfect areas for new species to arise. “There are a handful of entirely new species or subspecies, particularly of insects, that have developed in particular kinds of urban environments.” (Alagona, 2022, as cited by Poon, 2022). Additionally, having areas for animals within the cities is also beneficial for humans, given that green and blue spaces in an urban jungle have positive effects for people’s health-both physical and mental. “(...) planting trees, establishing new parks and cleaning up polluted areas [are] decisions that people made consciously for reasons that had to do with human health, human well-being, the urban environment, (...)” (Alagona, 2022, as cited by Poon, 2022).

On the other hand, the negative effects relate to the loss of biodiversity. “Rapid urbanisation has caused the fragmentation of habitats for animals worldwide and loss of natural habitats.” (Sarkar & Bhadra, 2022). Not only have these changes become hazards for habitats, but they have also made it difficult for some animals to adapt to these new spaces, since humans are not designing the spaces for any other beings but themselves. “(...) we’re rearranging and degrading ecosystems in ways that make the world a much harder place to live for the vast majority of species out there.” (Alagona, 2022, as cited by Poon, 2022).

Cities are covering most of the land in the world, and as they continue expanding so do the negative impacts. “(...) humans have modified 77 per cent of terrestrial ecosystems (excluding Antarctica) and 87 per cent of oceans globally.” (Nature Conservancy Canada, n.d.). Humans should make changes in their cities to be more inclusive towards animals. “(...) we should promote a wildlife-friendly environment in the city while simultaneously working to

protect the natural areas for those who cannot adapt to the human-caused landscape.” (Wong, 2022).

1.4.1. Climate Change

Climate change is an important fact that has concerned people for the last few decades due to its heavy negative impact on the planet. Despite some actions already being taken to mitigate the issue, the problem continues and has profound consequences for every being, natural landscape, and ecology, and particularly as we go forth in planning or renewing urban centres.

Meteorologists say 2020 is the hottest year on record, on the heels of five of the hottest years ever recorded. Global warming is causing unexpected, escalating changes in our climate systems, resulting, among other things, in more frequent and longer periods of drought, extreme heat waves, fires, and intense flooding. (David & Reisman, 2021, pp. 142-143).

As mentioned by Filazzola *et al.* (2024), this anthropogenic impact in the world can threaten the presence of species living in the cities, becoming a hazard for the communities they represent. This problem is moving species from their natural habitats since it affects the natural status of the environment. “Climate change has altered marine, terrestrial, and freshwater ecosystems around the world. It has caused the loss of local species, increased diseases, and driven mass mortality of plants and animals, resulting in the first climate-driven extinctions.” (United Nations, n.d.).

While we cannot predict if all species will be equally impacted by global warming (Filazzola *et al.*, 2024), it has been determined that animals have had to migrate to different areas to try to find a new habitat, sometimes luring them to areas that represent a hazard for them, as well as for the balance of biodiversity. “While climate change is moving species across the continents (e.g., poleward and into higher elevations), city boundaries are relatively fixed in space and are therefore likely to undergo climate driven changes in biodiversity patterns.” (Filazzola *et al.*, 2024, p. 2). This puts animals at a mortal risk since their basic needs -shelter and food sources- can not be met. “The risk of species extinction increases with every degree of warming.” (United Nations, n.d.).

These impacts are not limited to natural spaces but also to wild animals that inhabit urban areas. “(...) the relatively short timeframe (...) and volume of climate change impacts will produce a dramatic change in many urban species communities.” (Filazzola *et al.*, 2024, p. 12). These changes are mostly linked to the service these animals provide to the ecosystem, such as the management of pests, the control of diseases, pollination, and decomposition. It is necessary to understand that there are consequences to the changes in the composition of urban spaces and that there should be some strategies to mitigate the impact and preserve the biodiversity (Filazzola *et al.*, 2024).

Moreover, it is important to understand that species that are looking for new homes are “environmental refugees,” and that new species will most likely move to urban areas in their intent to find new habitats. “With a growing number of species being affected by climate change amid an ever-expanding urban landscape, the incoming of wildlife to the city will soon become an inevitable phenomenon.” (Wong, 2022). Which is why cities need to be prepared for coexisting with these displaced animals.

1.4.2. Wildfires

Wildfires are produced by many factors. Pausas & Keeley (2021, p. 387) mention: “The occurrence of wildfires in an ecosystem requires the confluence of at least four factors: ignitions, continuous fuels, droughts, and appropriate weather conditions (wind, high temperatures, and low humidity).” These authors also present four factors that affect the regimes of wildfires:

1. **Ignition patterns**: A fire can be ignited by many natural sources such as volcanoes, falling rocks, and the most common one, lightnings. However, due to climate change, some of these ignition sources are being altered resulting in an imbalance of wildfires. “In a world undergoing marked alterations in climate and weather patterns, the spatial and temporal distribution of lightning activity may be changing (...), with unforeseen implications for the fire regime” (Romps *et al.*, 2014, as mentioned in Pausas & Keeley, 2021).

Additionally, natural sources are not the only source of ignition of wildfires. Humans also ignite them whether it is by accident or deliberately. “People cause fires accounts 98% of all fires, while natural factors are responsible for the remaining 2%.” (Jhariya & Raj, 2014, p. 887).

2. Fuel continuity: What fuels a wildfire is the flammability of the plants that are native to the area. However, invasive species of plants also have an impact and spread the fire. Additionally, human activities can also feed a wildfire. “(...) agriculture and urban infrastructure increase ecosystem fragmentation and reduce landscape fuel continuity” (Pausas & Keeley, 2021, p. 390). All these factors alter fuel patterns, increasing the possibility of fire spreading and making it harder to control.
3. Droughts: Common in nature, and their duration and severity depends on the area. In an ecosystem that is wood-dominated, droughts increase the possibility of a fire and enhances the fuel connectivity, whereas in an ecosystem dominated by grass, droughts are associated with a reduction of fire activity since grass reduces fuel continuity when it is dry. Additionally, climate change is becoming a big variable in the duration and the increasing number of droughts. “(...), climate warming is expected to greatly affect fuels, whereas changes in rainfall patterns are more variable; even on landscapes where rainfall is not declining, however, warming increases evapotranspiration rates, leading to both a drier climate and fuels.” (Pausas & Keeley, 2021, p. 392).
4. Fire weather: This refers to the weather conditions that directly affect fire behaviour by not only allowing the ignition but also influencing its size and its path. The wind is the biggest factor of a weather that is prone to fire, as well as elevated temperatures and low atmospheric humidity.

What some people may not know is that these fires are not only a problem for the ecosystem but are also an important aspect to maintain its balance. “Fires may also play a significant role in regulating ecosystem productivity and diversity by promoting mineralization of nutrients stored in organic matter and allowing the invasion of rapid growing early successional species.” (Jhariya & Raj, 2014, p. 887).

As Parks Canada (2025) mentions in its report, for many years there was a lack of understanding of wildfires as an important component of the function of a healthy ecosystem. If there are no fires, the fuel will load on the land which actually creates a bigger risk of a much bigger and uncontrollable fire igniting. Additionally, some ecosystems have also found a way to benefit from small-scale fires “Ash is a natural fertilizer for the soil and contributes to the growth

of new seeds in these areas. Fires eliminate dead and sick plants (...), allowing more sunlight to reach the ground and healthier plants to grow.” (Garcês & Pires, 2023, p. 100).

This is why, Parks Canada has been applying having planned wildfires in the last few years, learning from other cultures that already used this practice. “Indigenous peoples have been shaping and caring for the landscape with cultural fire for millennia.” (Parks Canada, 2025). By using prescribed fire in the landscape, the area will benefit by creating more resilient landscapes and making them more diverse. However, to adopt this practice, the fires must be very meticulously planned many years in advance to reduce risks, and even after several years of planning, they must be thoroughly monitored. “The plan undergoes a careful assessment of potential impacts and requires exact conditions to be met before ignition occurs.” (Parks Canada, 2025).

Most animals can sense an upcoming wildfire, which forces them to flee. Nevertheless, not every animal will be quick enough to escape the danger, and some even will be intercepted by carnivores that take advantage of the commotion (SPCA, 2024), and some other animals have different defense mechanisms, such as climbing trees or finding underground shelter (Garcês & Pires, 2023). Uncontrolled wildfires have a huge effect on the environment. “The consequence of repeated burns is detrimental because it is a key factor in the impoverishment of biodiversity in rain forest ecosystems.” (Nasi *et. Al.*, 2002, p.36). Nature is the one that is foremost affected by these fires, animals being the ones who suffer the most, since they can be severely injured or even demise. “Often the animals who don’t survive wildfires die as a result of smoke inhalation, oxygen deprivation, or serious injuries.” (SPCA, 2024). Nasi *et al.* (2002) mention the impact that uncontrolled wildfires have on the fauna of a forest:

1. Loss of habitat, territories, and shelter: Lots of animals lose the place they live in with wildfires, which causes a displacement of these beings. Animals that are displaced cause an imbalance in the ecosystem, which could have mortal effects.
2. Loss of food: Burned trees not only result the in loss of animals’ homes, but also their food. The loss of fruit trees is detrimental for the birds and mammals of the area, who avoid areas that are burnt. This also affects predators since their natural prey are avoiding the area.

3. Fire-adapted fauna: Not all effects are negative; there are some animals that are resilient to the fire and are able to adapt. As mentioned by the previously mentioned authors (2002), some examples of these animals are the grass-layer beetle in Australia and the moose in Canada.

Still, these are not the only effects that fires have on the lives of animals. The displaced animals will try to find new habitats, which might cause them to compete with other species. More importantly, some animals will even venture to find homes in places they normally tend to avoid, such as cities. “This new migration can also cause animals to wander into urban and suburban areas where they come into contact with humans they would normally avoid.” (SPCA, 2024).

1.4.3. Intensive Urban Development

From the beginning, humans have looked at nature as something to benefit from. They use the wood from the trees, the water from rivers, lakes, and oceans, minerals from earth, and even some animals to work for them or to feed from. Which would not be bad if it were controlled, but the sense of nature and the urgency of taking care of resources is not something people have had in mind throughout history.

At first, (...), forests weren't primarily seen as habitat. People didn't view a forest as a place where things lived, unless they wanted to hunt those things. Instead, forests were trees, and trees were wood to be used in shipbuilding, fires, and more. But as people cut down local forests, the things in them ran out of places to call home. (Brookshire, 2022).

But what they did not take into consideration was that the expansion of urban areas without a clear conscience of the ecosystem could damage the environment. “Urban areas directly consume land as their physical footprints expand, often resulting in complete landscape transformation.” (Güneralp *et al.*, 2019, p. 1).

With the increasing demand of urban areas and the desire of humans to have more developed and bigger cities, these resources are being increasingly threatened. “The upward and outward growth of urban areas around the world has both degraded the quality of existing natural habitat and increased the number of hazards found in cities.” (City of Toronto, 2016, p. 15). This is not only a problem for resources but also for biodiversity. There is a negative correlation

between modernization and nature; with more modernization and greater evolution in technology, the more people tend to forget about nature and the animals and leave them behind. “With our own continuing demand for more houses, more roads, more energy, and with our advanced technologies and sophisticated machines for meeting those demands, humans place greater and greater pressure on the habitats of other living creatures.” (Adams, 1994, p. 14).

The increasing urbanization development without a clear plan has led the cities to an unorganized expansion. “Dispersed urbanization, urban planning and management instruments such as zoning, and urban expansion zones, have become increasingly consistent in leading cities toward an uncertain and chaotic future.” (Polidoro *et al.*, 2012, p. 1010). In this chaotic state and without taking care of resources, the relationship humans have with nature has been negatively affected, especially with wild animals, since urban expansion takes over their natural habitats. “As humans continue to encroach upon wildlife habitats and ecology, conflicts between humans and wild animals have steadily increased” (Carter *et al.*, 2012, as mentioned by Shah, 2023, p. 13) .

Having wild animals in the areas that humans now occupy has become a problem for some people. “(...) we think of the urban animal as nuisance (...), instead of, thinking of them as the persistent survivors that they are, who continue to successfully prevail in the face of all the oppressive structures we have subjected them to.” (Shah, 2023, p. 14). Cities can become new ecosystems for wild animals, whether that was the original intention or not, and wild animals have learned very well to adapt to these new manufactured habitats. “Humans (...) aren’t islands unto ourselves. We alter the environments around us. We build ecosystems of concrete and brick and steel. (...). Human-built ecosystems (...) are invitations to animals in need.” (Brookshire, 2022).

The Urban Wildlife Working Group (UWWG) (2012) mentions in its annual report, it is important to undertake scientific research to understand the species that thrive in urban spaces, the characteristics associated with their persistence, and the impact this can have on the urban ecosystem.

Wild animals are increasingly coming into contact with people as cities continue to sprawl into undeveloped regions. Urban, suburban, and exurban growth can increase edge habitat, creating more opportunity for humans and wildlife to come into contact. Human

welfare and safety depend on a thorough understanding of urban wildlife and their interactions with the anthropogenic landscape. (The Urban Wildlife Working Group, 2012).

1.5. Ethics in Urban Animal Inclusion

As Henry Salt mentions on his book “Animal Rights: considered in relation to social progress” (1922), philosophers have always discussed whether non-human beings should have rights. The general response was positive, and the conclusion was not to harm innocent animals. However, in this discussion, non-human beings were always referred to as lower races, since humans are “rational beings,” which gave humankind an air of superiority over animals and the environment. This kind of language not only creates a sense of power dynamics but also justifies some actions that people can do that affect other beings. “(...) animals, like men, are possessed of certain limited rights, which cannot be withheld from them, as they are now withheld, without tyranny and injustice.” (Salt, 1922, p. 13).

In his book “The Creed of Kinship” (1935), Salt states that the kind of relationship humans should have in the future with animals should not be based on the idea of animal “domestication” but rather on the reconciliation of humankind with nature and how to establish relations with wild tribes. “(...) it is permissible for anyone to kill or torture them [wild animals] with impunity, except where the sacred privileges of “property” are thereby offended.” (Salt, 1922, p. 35). Animals are seen as property when they are used for humans’ benefit, whether they are used for labour, for entertainment, or even for companionship. A pet is more respected than a wild animal because it “belongs” to a human, and the only way to break this breach is by having a better relationship with wild animals.

(...) if we desire to cultivate a closer intimacy with the wild animals, it must be an intimacy based on a genuine love for them as living beings and fellow-creatures, not on the superior power or cunning by which we can drag them from their native haunts, warp the whole purpose of their lives, and degrade them to the level of pets, or curiosities, or captives. (Salt, 1922, pp. 39-40).

To have a better relationship with them, humans should have a better understanding of wild animals and their needs, and this understanding should also be accompanied by the break of

this power dynamic and the recognition that animals, nature, and people are on the same level of importance.

If we are ever going to do justice to the lower races, we must get rid of the antiquated notion of a “great gulf” fixed between them and mankind [*sic*] and must recognize the common bond of humanity that unites all living beings in one universal brotherhood. (Salt, 1922, p. 8).

One of the areas where this change should start is in urban planning, where animals do not play any role in. “As it is widely acknowledged, urban environmental ethics is an under researched area. But in the literature which does exist, animals play very little part.” (Palmer, 2003, p. 64). Research has been done on environmental ethics and the impacts this has on human life, but it is lacking the inclusion of animals in the human–urban environment relation. It is also a responsibility of humans to bring animals to the discussion since the creation of cities and the urban expansion are affecting them directly and their habitats. “(...), humans—by taking over wild animal territory—have a collective causal responsibility for the presence of such animals in urban areas. Does this *causal* responsibility suggest any kind of *moral* responsibility for these individuals and populations?” (Palmer , 2003, p. 71).

The land of cities used to belong to wild animals that have either been displaced or killed with the urban development. And a way to amend the negative impact of cities is by including animals in the design of urban cities, giving them spaces to inhabit and fulfill their basic needs. “(...) in existing urban areas, and especially in newly urbanizing areas, spaces should be maintained, or created, to allow otherwise displaced wild animals to continue to live.” (Palmer , 2003, p. 71)

1.6. Research Questions and Hypothesis

Thus, the main research question of this project is: **how can people find the balance in living with animals in urban areas?** Animals have always lived in the city and due to climate change and habitat loss because of urban densification, people must learn how to share space with them and coexist in spaces that are not human-centered.

Animals have always been the ones who have had to adapt to the changes humans have made, and while this is a great characteristic of them, humans should also adapt to the needs of animals. Which is why the first secondary research question of this project is, **what are some strategies humans can adopt so they adapt to animals?** Despite people knowing the dangers the ecosystem is currently facing, some are so used to their way of living that they are not really interested in sharing their spaces with other beings. Hence, the next secondary research question of this project is **how can people change their mentality about having animals adapting to the cities?** The idea of a city where humanity, urban wildlife, and nature can coexist peacefully may be difficult to accomplish, so the final secondary question of the project is: **is it feasible to produce initial guidelines or suggestions for all these beings to coexist peacefully in the same urban environment?**

Lastly, the hypothesis that **with some strategies humans apply to the design of their cities, they can produce more inclusive spaces for all the beings that inhabit them.**

2. Literature Review

2.1. Defining Urban Wildlife

The Cambridge Dictionary (n.d.) defines wildlife for the United Kingdom as “animals and plants that grow independently of people, usually in natural conditions,” and for the United States as “animals that live independently of people, in natural conditions.” Regardless of the country the definition is addressed to, we can state that when referring to wildlife, we are talking about beings that live in nature, without human intervention.

Within the category of wild animals, a subcategory called wild urban animals can be found, a name that is used for the ones that can be found in areas that usually humans inhabit. “Urban wildlife animal communities consist of species that utilize human dominated ecosystems.” (The Urban Wildlife Working Group, 2012). These animals are called wild because they live in nature and without human intervention; however, they coexist with humans in cities, urban areas, suburbs, and even most of them in rural areas. In the city of Toronto, it is quite common to find wild urban wildlife since it is a city with great biodiversity.

Toronto’s urban wildlife is incredibly diverse, with thousands of unique species calling this city home. Our parks, green spaces, and ravines provide an ideal habitat for many animals including coyotes, foxes, raccoons, deer, skunks, opossums, squirrels and more than 300 species of birds. (City of Toronto, n.d. a).

The Urban Wildlife Working Group (2012) organizes the urban wildlife into four distinct categories, which are:

1. Human obligates: The first category consists of animals that are domesticated, which may cause some to not consider them as wild animals. Still, they play a key role in this group since they compete and often predate on native species. Animals that belong to this category are domestic cats, domestic dogs, and livestock.
2. Human associates and exploiters: Usually composed of omnivorous species that can take advantage of human food sources (such as food waste, pet food, feeders, gardens, among others). These animals thrive in urban areas where they can find more of those resources, but they can also inhabit developing areas due the lack of predators and other

competitors. Some animals that can be found in this category are raccoons, opossums, squirrels, mice, pigeons, and gulls, among others.

3. Human adapters: The animals that belong to this category may use human resources and survive in areas that humans inhabit but do not necessarily get a benefit from coexisting with humans. These animals are usually located in areas dominated by urban development. Some human-adapted animals are deer, bobcats, coyotes, skunks, red foxes, robins, cardinals, and hawks, among others.
4. Human avoiders: The final category is confirmed by animals that are not usually expected in urban areas but may approach a human-dominated area while dispersing or migrating. These animals can experience high mortality rates in human-dominated areas, and either have a history of conflict with humans or specific habitat requirements that causes struggles for them in urban areas. The number of animals that can be found in this category is quite large and varies depending on the native species of the area, but some of them are mountain lions, wolves, grey foxes, woodpeckers, among others.

For the project, we are limiting the sample of wild urban animals to the ones that are usually found in the city of Toronto: the human associates and exploiters, and the human adapters. We are not focusing on insects, since that is a broader group, and they naturally coexist with humans without strong changes to adaptation.

2.2. Friendly Neighbours or Pests

Humans have had different relationships with both wild and domesticated animals throughout history. While some animals were trained to work for people's own benefit, currently, working animals are not something as common as they were in the past. MacKinnon (2013) expresses that the line between "pet" and "work animal" used to be blurred. The domestication of animals began with a need, but it is now transforming into a symbiotic relationship based in mutual respect that can grow between humans and animals. "Modern concepts of 'pet' imply personal relationships of intimacy and mutual understanding between animals and humans" (MacKinnon, 2013, p. 116).

However, there are other animals that not only are not "worthy" of respect but happen to be considered 'nuisances,' and a hazard to human health, such as pests. This term was introduced to describe animals, mostly insects, that are considered a problem for humans. "One definition of

a pest is 'a troublesome thing'" (Kirkwood, 1987, p. 97). According to the EPA (2025), this range of animals include cockroaches, flies, mosquitoes, ticks, rats, mice, some reptiles and mammals, and a host of various microorganisms, while not directly animals, are nonetheless detrimental to human and animal welfare. Unfortunately, there is a status connotation, where households that have pests that cannot be controlled are seen as a low-status "According to this view of urban space, flies unified city-dwellers across social status and location. Middle- and upper-class citizen seldom saw or smelled fly-breeding landscapes" (Biehler & Cronon, 2013, p. 39). Houses are considered low-income since the presence of pests means that they are not sufficiently sanitized. "The appearance of pests, they believed, should signal to a producer that the ecosystem of his farm was somehow unhealthy" (Biehler & Cronon, 2013, p. 182).

It is highly likely that problems with animals seen as pests started with the first efforts of urbanization. "Pests are a problem as old as ownership. When people were fully immersed in the natural world, and grew no crops, the word "pest" probably did not have a lot of meaning." (Brookshire, 2022). Yet, the term is quite subjective, since what can be a nuisance for someone can be an adorable animal for someone else. As Brookshire (2022) mentions in her book, it is all about perspective and how we see an animal. This author tells a story about a squirrel that lives in their backyard, and every year it destroys their crops and garden, so they consider them a pest, while others consider squirrels friendly neighbours.

"Pest" may seem like a bit of an offensive label for something as cute as a squirrel. It puts them in the same category as rats, mice or pigeons. All of these animals that aren't staying in what we've decided is their place. A squirrel in a tree is adorable. A squirrel in your garden, or nesting in your roof, is an annoyance. Something that we should, at the least, control, and at worst, eradicate. (Brookshire, 2022).

As mentioned, some animals are seen as pets or friendly neighbours we share our spaces with; this is if they are seen as useful or if they have some kind of value, while the animals that are considered hindrances in people's lives or their properties are clearly defined as undesirable.

When we are observing squirrels through the safety of our camera lens, when we have nothing, they want, they are adorable wildlife. When they have the temerity to nest in our chimneys, move into our attics without paying rent, or use our gardens as an all-you-can-eat buffet, it's another story. (Brookshire, 2022).

2.3. Making Animal-Friendly Cities

There have been several attempts to design animal-friendly areas. People are starting to understand that animals are important to the city and that those areas are also their homes, so it is important to design for them. Additionally, as mentioned by Rotberg (2024) “Innovative infrastructure that helps wildlife move safely across urban areas is not just about keeping them safe — it is about fostering a deeper connection to nature within our cities.” Some current projects are:

2.3.1. Bird Control - Pigeons

Birds can be considered a nuisance in some urban areas, especially pigeons, which can be found all throughout the city. However, we tend to forget that pigeons are animals that were domesticated by humans many years ago.

Many scholars point to the domestication of feral pigeons in ancient Mesopotamian settlements that date back approximately 10,000 years. These birds (city-dwelling descendants of the dove) were baited into human settlements using grains to assist our ancestors in navigating uncharted territories. (George, 2024).

Pigeons were used to send messages, and their feces were used as great fertilizers; some even bred them for consume since they were seen as a protein source (Carlen & Moles, 2022). These animals have thrived in urban areas due to their ability to consume food waste generated by humans and because the buildings found in cities are like the cliff-dwellers that were these animals’ original habitats, so they are now prone to creating their nests in these urban structures.

The pigeon overpopulation has created a lot of problems in different cities and people have tried different options to get rid of them, such as installing metal spikes in areas where they should not be and even bringing predator birds to control population. Still, none of these were as effective as the solution TransLink is proposing along with the British Columbia’s Society for the Prevention of Cruelty to Animals (SPCA). In Vancouver, pigeons were not only becoming an inconvenience for the public, but they were also becoming an issue for the SkyTrain transportation, delaying some trains, and roosting in their stations.

This is why the transport company along, with their local SPCA, is “testing a feeding system that distributes corn laced with a contraceptive called OvoControl.” (Baker, 2019). This

feeding system is being installed in the city for the new medicine to be distributed to the animals since it must be consumed daily to keep them from laying fertilized eggs (see **Figure 4**). “Dr. Sara Dubois, chief scientific officer of BC SPCA, said the method doesn’t harm the birds and will begin reducing a station’s local pigeon population within a year.” (Vikander, 2019). In addition to this, the pill is also considered to be eco-friendly since it breaks down in the pigeon’s bloodstream and is non-toxic, which makes it safe for the pigeons and its predators. This is a highly effective way to control this bird’s population. “Studies have shown that the OvoControl feeder can reduce local pigeon populations by 50 to 90 per cent, according to TransLink.” (Vikander, 2019).

Figure 4: *Sara Dubois, chief scientific officer with BC SPCA showing a pigeon feeder with OvoControl*



Note: Picture credits to Michaële Perron-Langlais as mentioned by Baker (2019).

Source:

<https://www.cbc.ca/news/canada/british-columbia/vcc-clark-skytrain-pigeons-birth-control-1.5010904#:~:text=TransLink%20has%20long%20struggled%20with,to%20control%20the%20pigeon%20population.>

2.3.2. Bird-friendly Buildings

Along with the increasing urbanization of cities and their modernization come some new challenges that the animals that currently live in those areas must adapt to. One of them is the problem migratory birds have to face with modern buildings. “The increased use of glass in our modern buildings, including large expanses of highly glazed or ultra-clear glass, presents a serious hazard for birds. Most birds don’t perceive glass as an obstacle.” (National Audubon Society, 2025a). Modern buildings are completely covered in bright lights that attract the migratory birds, and glass that are a hazard for them and their lives.

Recent estimates suggest that about 25 million birds die each year from window collisions in Canada. A disproportionately high number of these fatalities occur in Toronto due to its location adjacent to Lake Ontario; at the confluence of the Atlantic and Mississippi Migratory Flyways, and to the fact that it contains one-third of all tall buildings in Canada. (City of Toronto, 2016, p. 8).

In addition to the collisions, the lights that cities generate can create confusion for migratory birds since they use light to find their way. “Artificial lights and skyglow around buildings can be fatal to migrating birds.” (National Audubon Society, 2025a).

To minimize these risks, the American organization National Audubon Society has a couple of programs in motion. The first one is called Lights Out, which is –as its name suggests– a program that aims to reduce the quantity of lights on buildings to help migratory birds. “The strategy is simple: by convincing building owners and managers to turn off excess lighting during the months migrating birds are flying overhead; we help to provide them safe passage between their nesting and wintering grounds.” (National Audubon Society, 2025b). The program is important during the migratory season, given that most migratory birds migrate at night; they use the light as a navigation system, and bright lights in cities not only attract these birds but can also disorient them. “To find their way during these flyovers, birds use natural cues including the moon and stars to navigate. Light emanating from urban areas obscures these natural cues, which disorients and confuses the migrating birds.” (City of Toronto, 2016, p. 14). There have been studies that reveal that this program is effective, and its application has helped reduce the mortality of deaths by collision “By turning off just half the lighted windows during spring and fall migration, (...), fatal bird collisions could drop by 60 percent.” (Wetzel, 2021)

The second program this organization has is Reducing Collisions with Glass, and it is focused on creating visual cues to reduce the risk of birds colliding into the windows of tall buildings. “Shiny glass exteriors, internal plants near windows, glass corners, and greenery close to buildings can all be deadly as birds are unable to distinguish reflection from open flyway.” (National Audubon Society, 2025c). For this project, the American organization has some suggestions for these visual cues, such as creating patterns on the surface of reflective glass, using external screens on windows, having blinds or curtains closed in the buildings, not putting interior plants close to a window, and placing bird feeders directly on windows (2025c). These

suggestions do not affect humans in these buildings but can create a significant difference for birds and even save their lives. “The impact of striking a reflective or clear window in full flight often results in death.” (City of Toronto, 2016, p. 14).

In addition to the ideas given by this organization, the City of Toronto (2016) created bird-friendly development guidelines. These guidelines are:

1. *Building Envelope*: Reducing the quantity of glass in the design of a building to be more bird-friendly. “A building designed with a total window surface area of 25-40 percent relative to the entire facade (low window to wall ratio) can reduce fatal bird collisions.” (City of Toronto, 2016, p. 24). This strategy, combined with passive solar strategies, can improve high-quality light, and help reduce energy.
2. *Design to eliminate fly-through conditions*: According to these guidelines, free-standing architectural elements, and areas in the building where glass is perpendicular are dangerous for birds since they can see through them and collide while trying to get to the other side. Which is why it is important to eliminate these from the design.
3. *Awnings and overhangs*: The implementation of these features in the design of a building can create visual cues for birds to avoid and reduce the amount of visible glass. However, these are not as effective as other strategies. “(...) awnings and overhangs, and other building-integrated structures do not completely reduce reflections and as such are considered far less effective than visual markers applied directly to glass.” (City of Toronto, 2016, p. 25)
4. *Exterior Screens, Grilles, Shutters, and Sunshades*: Using elements as visual cues for birds can minimize the risk of collision of birds. “Decorative facades that wrap entire structures can reduce the amount of visible glass and thus the threat to birds.” (City of Toronto, 2016, p. 25). Integrating elements such as nets, exterior screens, shutters, and exterior shades into the design of a building can create an important visual cue for birds without affecting the composition of the design.
5. *Creating Visual Markers*: In addition to the visual cues and previous strategies, the glass used in the buildings should also be bird-friendly, which is why they must have visual markers, such as patterns. “Studies have shown that visual markers spaced at a maximum of 10 cm apart are effective at deterring collisions with glass.” (City of Toronto, 2016, p.

26). The glass should also be non-reflecting, which is not as effective as the visual cues by itself but adding it to the patterned glassed is a terrific way to design buildings for both humans and birds.

Figure 5: *The York University TTC Subway station glass wall*



Note: Picture credits to [stepspublicart.org](https://www.stepspublicart.org) as mentioned by Rotberg (2024). Source: <https://www.evergreen.ca/stories/roommates-heres-how-were-peacefully-sharing-our-cities-with-wildlife/>

2.3.3. *Swift Bricks and Boxes*

Another way to take care of birds is by providing them with safe spaces for nesting. Since their habitats are being endangered, they are losing places where they would normally nest, which affects the species reproduction. “Changes in architecture have meant a reduction in important nooks and crannies that are utilised as nesting sites by species such as swifts, reducing reproduction rates in urban areas.” (Ketley, 2022).

In the UK, one of the affected birds were swifts, given that these birds usually nest in houses and buildings and tend to come back to the same nest every year, but increasing urbanization has been affecting their habitats. “Swifts rely on nest sites in buildings but unfortunately many traditional sites disappear each year through renovation, insulation and demolition, while new buildings exclude them from the spaces they normally use.” (Day *et al.*, 2019, p. 38). To help these birds, a proposal for artificial nests was made, named “swift boxes” or “swift bricks” (see **Figure 6**); these boxes can be mounted in buildings or houses to provide these birds with a new habitat. “Swift boxes can be mounted externally or fitted internally, either flush with an external wall or inside a roof space” (Day *et al.*, 2019, p. 39).



Figure 6: *Bricks for birds*

Note: Picture credits to Dick Newell as mentioned by Ketley (2022). Source: <https://www.nhbs.com/blog/universal-nest-bricks>

In the UK, the artificial habitats were adopted given their major benefits for birds and that it is not an inconvenience for humans at all. The boxes provide a cool environment for birds that does not require maintenance and that it's lasting (Snaith, 2023). Additionally, its installation, as mentioned before, can be inside of a structure or outside, giving it the flexibility to be replicated in either new edifices or existing ones. "Swift bricks are usually installed in new buildings or during major renovations, but it is possible to retrofit them into an existing wall." (Snaith, 2023).

However, these bricks were proven not only to be used by swifts but also by many other similar species of birds. "Providing suitable nest boxes has been shown to help increase reproduction rates for many species, helping to boost populations." (Ketley, 2022). They are now considered to be 'universal' nest bricks. This project was so greatly adopted that the UK government is creating policies for its use in buildings. Ketley (2022) lists four key requirements that the British Standard has set for these nest bricks:

1. Integral number of boxes: there should be at least one nesting box per residential unit on average.
2. Integral number of boxes in larger buildings: there is not an upper limit, but it should be proportionate to the dimension of the design.
3. Entrance of the boxes: the size of the entrance holes should be 30mm x 65mm minimum unless there is an exceptional circumstance.
4. Placement of the entrance: it must be located close to the base of the box to prevent birds from getting trapped.

2.3.4. *Bee Bricks*

In the same note, there is another project called Bee Bricks (see **Figure 7**). These invertebrates are the most important pollinators in the world. “(...) roughly 90% of the world’s plant species are pollinated by animals, and the main animal pollinators in most ecosystems are bees” (Winfrey, 2010, as mentioned by Christman *et al.*, 2022, p. 286). The quantity of bees is declining for distinct reasons, and one of the biggest ones is the loss of their natural habitat, which is why it is especially important to create new spaces for them to live in, nest, and, in the case of the females, lay eggs (BBC, 2019). However, there are so many current ideas that are not necessarily the best solution given their lack of sustainability over time. “There are many products already available for use in urban gardens, but existing designs are ornamental, short-lived, and designed mainly for aesthetic purpose” (Christman *et al.*, 2022, p. 302).

This is not something that has recently gained people’s attention; artificial habitats for bees are something that has been studied since the 20th Century. “Artificial nesting habitat for solitary bees has been studied since the early 1900s and utilised since the 1950s, when use of some species for pollinating commercial crops was first considered.” (Christman *et al.*, 2022, p. 288). This project, however, focuses on solitary bees, who find habitats by cavity-nesting, and their main occupation is to be pollinators. “The bricks are made for solitary bees, which don’t live in hives or produce honey.” (BBC, 2019).

Bee bricks are made with natural materials and holes in their design for bees to get in and then cover them with mud and nest.

The Bee Brick therefore aimed to create nesting habitat for cavity-nesting bees and wasps within sub/urban communities that was designed to be an integral part of the build, offering the dual function of being a construction material that also promotes biodiversity. (Christman *et al.*, 2022, p. 290).

Since these bricks are made with natural materials, they do require maintenance due to the microorganisms. “Bee Bricks may require ongoing management, particularly to reduce parasite loads or fungus and mould within bricks.” (Christman *et al.*, 2022, p. 290).

As mentioned by Thomoglou *et al.* (2024), this is an innovative product that is friendly to the environment while creating a natural ecosystem for these pollinators. In addition to the design, Christman *et al.* (2022), list the requirements Bee Bricks have:

- They must be strong enough to be part of a structure and used to build edifices.
- They must be long-lived and cannot degrade over time.
- Its material must be friendly for the environment.
- Its material also should be low-cost and recycled.
- Its productions should be done with little mechanical devices

Bee bricks not only are a great solution for the habitat loss bees are going through but can also be used in architecture as decorative pieces and even for educational purposes. “It presents a distinct solution that addresses the dual need for biodiversity and the benefits of utilizing construction materials for both load-bearing masonry and as an abode for pollinator bees.” (Thomoglou *et al.*, 2024, p. 7).



Figure 7: *Bee Bricks*

Note: Picture credits to Adam Cormack as mentioned by BBC (2019). Source: <https://www.bbc.co.uk/newsround/46780877>

2.3.5. Bee highways

Pollinators are not only important to fertilize plants that produce food for humans, but they are also important to animals with their food and habitats. They maintain the biodiversity. As mentioned before, bees are amongst the most important pollinators, which is why it is said that they are important for human and other animals’ survival. “According to bee experts at the Food and Agriculture Organization (FAO) of the United Nations, a third of the world’s food production depends on bees.” (UNEP, 2022). However, bees are threatened by climate change, air pollution, and some other human actions. “Bee populations have been declining globally over

recent decades due to habitat loss, intensive farming practices, changes in weather patterns and the excessive use of agrochemicals such as pesticides.” (UNEP, 2022).

Scientists saw it as a motivation to not only advocate for bees but also produce different suggestions to improve their current situation. One of these ideas is called Bee highways, which is a “linear green infrastructure that consists of green spaces rich in melliferous herbs and shrubs planned, implemented to be a precious [*sic*] support to pollinators.” (Parco Nord, 2023, p. 2). The aim of this project is to create a green connection for bees so they can travel through an urban environment with access to food and places to rest in. “The idea is to connect fragmented habitats within cities, allowing bees and other pollinators to move freely and find food throughout urban areas.” (Rotberg, 2024). There have been studies that prove that these highways are crucial for the survival of bees because they constitute continuous habitat, which will help to maintain or even increase the population. “Christian Steel at the Norwegian Biodiversity Network, an organization working with amateur and professional biologists in Norway, explains that the bee highway project can help protect bees.” (Abdi, 2016).

Bee highways, as mentioned, are a green path for the bees and can include zones with flowers and plants in buildings. “The idea of the bee highway is to provide bees with natural pollen at stations located no more than 250 meters apart.” (Miksha, 2015). Still, plants are not the only thing important in these highways. Bees also need to rest while travelling long distances, which is why another accommodation is needed in these paths, such as insect hotels and hostels (see **Figure 8**). “Bugs hotels are a fundamental [*sic*] aspects of a bee highway [*sic*] as refuges and hibernating [*sic*] areas are essential for pollinators to thrive.” (Parco Nord, 2023, p. 8). Hotels are the equivalent of birdhouses and are good for both bees and wasps, animals that would normally nest in a hollow wood. Hotels “simulate this nesting habitat by providing a bundle of hollow reeds or stems, or holes drilled in a wooden block. Nesting tunnels can be sheltered from weather and predators using a variety of structures.” (Youngsteadt & Favre, 2022).



Figure 8: *A bee hotel*

Note: Picture credits to Elsa Youngsteadt as mentioned in Youngsteadt & Favre. Source: <https://content.ces.ncsu.edu/how-to-manage-a-successful-bee-hotel/what-is-a-bee-hotel>

2.3.6. Wildlife crossings

Another component that can be found in cities and can be a hazard for animals are roads and highways. Animals are in constant movement either to find food, shelter, reunite with their pack, or even because of migration, and when they find a road or a highway in their path, they will cross it, endangering their lives and the lives of the drivers. “When animals meet a transportation route, which obstructs their migration path (...), they must enter the road, which increases the risk of collision with vehicles.” (Beben, 2012, p. 89). Crashes, as mentioned, can have grave consequences for both wildlife and people, “Wildlife-vehicle collisions can be deadly. Animals and people can be killed or injured.” (Main, 2017).

To minimize the risk of collision with wild animals, the Ontario Society for the Prevention of Cruelty to Animals (SPCA) and Humane Society (2023) proposes some steps for drivers to be more aware:

1. *Take extra caution during high-risk hours:* Most accidents that are related to wildlife happen either early in the morning or late at night. Which is why it is important that

drivers are more alert within these hours, watch for the glow of eyes that may be reflected by the headlights, and reduce the speed so it is easier to come to a full stop if necessary.

2. *Not entice animals to the road:* As mentioned before, animals look for different food sources, and some have adapted to feeding from humans' food waste. Which is why throwing food or food wrappers from the car window can be one way to attract an animal to the road. Additionally, household garbage is also a way to attracts animals, which is why it is important to be careful when taking the garbage container out for waste collection day, since we can incite animals when putting the containers next to the road. "Putting garbage out the morning of collection, rather than the night before, and using wildlife-proof containers is a good way to prevent animals from lingering on the roadside." (Ontario SPCA and Humane Society, 2023).
3. *Be on the lookout for warning signs:* The Ontario Ministry of Transportation places warning signs in areas where it is more common to find animals, especially big ones such as deer and moose, and there is a higher risk of collision. Which is why it is important that drivers are aware of these signs and take extra caution. Drivers may also consider using ultrasonic devices that emit an ultrasonic sound that only animals can hear, inciting them to flee.
4. Being compassionate about injured animals: Drivers may find injured animals on their way. If possible, they can help the animal by taking it to the local wildlife rehabilitation centre or calling and getting help. It is important that drivers help only if it is safe for them to do so.
5. *Planning wildlife-friendly roads:* Local governments may plan safer roads for animals. They not only can propose these steps for drivers, and signage, but they can also create wildlife passings or crossings in those high-risk areas.

As mentioned, there are some precautions humans can take to reduce the risk of wildlife collision, but there are other plans we can adopt, such as wildlife crossings. "As people have become more aware of these dangers, one strategy to mitigate them has gradually gained acceptance: human-made highway crossings designed just for animals (...) The most common forms of wildlife crossing are bridges and overpasses, tunnels, viaducts and culverts." (National Geographic Society, 2023). Crossings are a terrific way to prevent accidents, and they are important for the safety of both animals and humans. "Wildlife overpasses are doing one job

well. They stop animals from wandering onto busy highways — saving both people and animals from the carnage of high-speed collisions.” (Pike, 2022). As mentioned by Beben (2012), there are three types of wildlife crossings:

1. Crossings over a road or overcrossings: they can be landscape bridges, bridges, or a crossing in a mountain that goes over a tunnel. Green Bridges, for example, are overcrossings, named like this because they are covered with native vegetation to try to mimic the natural landscape to incite animals to use it (see **Figure 9**). “The crossings often work most effectively in conjunction with highway fencing, placed strategically on one or both sides of the entrance to funnel wildlife toward the corridor.” (National Geographic Society, 2023).



Figure 9: An overpass in a highway

Note: Picture credits to Ross MacDonald as mentioned by Greenfield (2021). Source: <https://www.theguardian.com/environment/2021/jan/23/how-wildlife-crossings-are-helping-reindeer-bears-and-even-crabs-aoe>

2. Crossings under a road or underpass: they can be flyovers, extended bridges, extended culverts, tunnels, or amphibian passes (see **Figure 10**). One example of an undercrossing is the Ecoduct, a concept used first in Sacramento in 1995 when “the city built a 15-centimeter (six-inch) wide tunnel, or "ecoduct," to allow frogs to pass under Pole Line Road toward a wetland on the other side” (National Geographic Society, 2023). These ecoducts have then been replicated in other places, such as Banff National Park in Alberta, which is said to have the best wildlife crossing system.



Figure 10: A bear going through an underpass

Note: Picture credits to the Confederated Salish and Kootenai Tribes, Montana Department of Transportation, and the Western Transportation Institute as mentioned in Eggert (2022) Source:

<https://montanafreepress.org/2022/01/04/montana-wildlife-crossings-past-and-future/>

3. Crossings on the road surface: they can be either controlled or uncontrolled. In the controlled ones, we can find passes with special signing (see **Figure 11**), with speed limits or without fencing or barriers.



Figure 11: A wildlife crossing with a sign in a highway

Note: Picture from Rotberg (2024) Source:

<https://www.evergreen.ca/stories/roommates-heres-how-were-peacefully-sharing-our-cities-with-wildlife/>

Animal crossings are becoming more common, since there are studies that prove that animals use them regularly and it is beneficial for them. A study made by Sandra Ng *e. al.* (2004) that aimed to recollect quantitative data of animals that used wildlife crossings in highways located in southern California found “regular use of underpasses and drainage culverts beneath highways by wildlife, including species of conservation concern” (p. 504). They also found that there is a correlation between the size of the animal and the type / size of passage they use “large and medium-sized carnivores, deer, and other species will regularly use passages beneath highways. Larger carnivores, specifically bobcats and coyotes, traversed passages of a wide variety of sizes,

from the largest spanning bridge underpasses to the smaller pipe culverts” (Ng, *et. al.*, 2004, p. 505). While some animals prefer the type of crossings they use, the size remains important for more animals to use them. “In general, research has shown that wider overpasses encourage a wider variety of species to cross. That is key, if the goal of the overpass is to keep animal habitats connected.” (Pike, 2022).

2.3.7. Urban Forests

In a city filled with concrete, it is important to also have green areas. This is both beneficial for humans and for animals. Studies have shown that designing spaces where people can have access to connect with nature can have a positive impact on people’s mental health (Roe & McCay, 2021). A study made by Snep *et al.* (2006, p. 346) mentions that “Recent studies have shown that urban green areas (both urban parks and cemeteries as well as small green areas at street level) play an important role in the quality of the human living environment.” In addition to mental health, green spaces are important for humans because they a way to battle climate change. “Trees not only provide the oxygen we breathe, but they also play a vital role in climate change mitigation and adaptation, air pollution removal and energy conservation.” (Damian, 2020).

In cities, we can find different green areas such as parks, parkettes, hiking trails, and even cemeteries, among others. Those spaces are part of the urban forest “The urban forest, which includes vegetation along urban streets and in urban parks, woodlots, abandoned sites, and residential areas, can comprise a significant percentage of a nation's tree canopy.” (Alvey, 2006, p. 196). The Toronto and Region Conservation Authority (TRCA) states “the term urban forest is used to describe the trees and woody shrubs located on all private and public property within a watershed, including urban spaces (...) and in forests.” (n.d.). Green areas are important within the city because they are a way to help with biodiversity conservation since they help with the conservation of natural habitats.

Once urban foresters and city planners recognize that urban forests are capable of supporting considerable amounts of biodiversity and have a basic understanding of the patterns and processes that affect biodiversity, addressing the question, “What can be done to actively preserve and promote that diversity?” becomes crucial. (Alvey, 2006, p. 198).

It is important to maintain these green areas for the benefit of society. “(...) urban forests are threatened by development projects, which often require cutting down trees. Even if new trees are planted, they don’t readily provide as many benefits as mature trees do.” (Damian, 2020). To help with the conservation of urban forests, there is a practice called forestry, whose main objective is “(...) the cultivation and management of trees for their present and potential contribution to the physiological, sociological and economic well-being of urban society.” (Jorgensen as cited by Bardekjian, 2018). This practice assumes the responsibility to take care of wildlife, fires, insects, and other important subjects (Ontario Professional Foresters Association , n.d.). “Urban forestry embraces the management of trees as well as the associated biotic and abiotic components in small communities and the interstitial areas between” (Bardekjian, 2018).

2.3.8. Wildlife proofing properties

People often forget that, when building a new home or a building, first the area must be cleared up, which may impact wildlife that already lives there. “(...), consider the enormous hardships these (...) wild species encounter because so much of their habitat has been destroyed. Each year they are forced into closer contact with humans and must compete with us for food, shelter, and space.” (Ontario SPCA and Humane Society, 2019). Since the moment a new house is being build, humans are already sharing the space with animals, which is why wildlife-proofing the property would make this coexistence easier and safer for both people and wildlife.

As mentioned before, animals are attracted to an area that provides them with the basic needs, which is why an effective way to wildlife-proof a house is by eliminating access to food or food waste, access to water, or access to shelter. The Ontario SPCA and Humane Society (2019) and the City of Toronto (n.d. b) suggest the following, among other ideas:

- To limit access to food waste: using garbage cans with secure lids, taking out the garbage on the morning of the pick-up, using lights that are activated by motion to scare animals away, keeping barbeques clean, not leaving pet food outside overnight, not feeding wild animals regularly, limiting bird feeders to the winter season and growing plants that attract them during summer and spring.
- To limit access to water: fencing pools, not leaving pet water bowls outside overnight, blocking ponds or fountains with nets, or using motion-sensing lights to scare them away.

- To limit access to shelter: constant cleaning eavestroughs to prevent birds nesting in them, covering vent openings with wire mesh, locking pet doors, and checking constantly windows and shingles to make sure they are in good condition and without damage.

For people with gardens, a clever way to keep animals away is to surround the perimeter with a fence to keep rabbits or deer away, or cover fruit and vegetables with nets, plastic, or metal screens to protect them from birds. The Ontario SPCA and Humane Society (2019) also suggests using environmentally friendly, non-toxic pesticides to kill grubs and larvae that animals normally eat, while the City of Toronto (n.d. b) suggests avoiding having woodpiles outside, since many animals can use them as hideouts or places to nest.

Lastly, it is important to know that, while humans can prevent animals from approaching their property, it is vital that they understand that relocating an animal is something that should not be done since it is a hazard for wildlife. “Studies have shown that many relocated animals die when placed in an unfamiliar environment. Relocation has also been linked to the spread of diseases, like rabies.” (City of Mississauga, n.d.). Which is why it is important to contact the correct authorities to take care of any issues with wildlife.

3. Methodology

The methodology applied in this study is data-driven design. This project uses mixed methods to retrieve both qualitative and quantitative data that was later analyzed. It is important to note that this research is based in Toronto, Ontario, which is why all the methods used are focused on gathering primary and secondary data about this Canadian city and its inhabitants. Some of the methods will be applied to subjects that may not be living in the area currently but are informed about it and/or have lived here in the past or in a similar city.

The following are methods used to gather data for this project.

3.1. Secondary Data Review

The main goal of this study was to gather as much information as possible about current projects that aim to include animals in urban settings, as well as other topics related to this. For this, different papers, research, and publications were reviewed. This was an ongoing method that started once the topic of the project was determined and went throughout the length of the investigation.

3.2. Anonymous Survey

The first method used to gather primary data was an anonymous survey made in Microsoft Forms. This method was focused on gathering information about the experiences of the people living in the city. This survey was designed for current or past residents of Toronto, and its diffusion was through a QR code on a flyer that was posted in different boards in colleges throughout the city and public places where it was allowed. A link to the survey was also shared by the student researcher throughout social media to ensure a greater reach. The survey was anonymous and did not gather any personal information of the participants since it was not necessary for the purpose of the project. The survey was focused on gathering information about five aspects.

The first one was information about themselves, the ethnicity they identify with, and their gender. The goal of this one was to understand if there was an impact on their beliefs based on their cultural background and/or based on their gender. The second aspect was their current living status, they are asked if they currently live in Toronto or if they had lived here in the past, then they were asked in what kind of area do they lived in: in an urban area, in a suburban area, a

rural area, or a farm; then they were asked what kind of place they currently live in: a townhouse, house, an apartment or a condominium; additionally, what kind of natural features they have near the area they live in: parks, parkettes, valleys, hiking trails, lakes, among others. This aspect was more focused on the context they are currently placed in; it was important for this research to understand the different circumstances people living in a townhouse in the suburbs has in comparison to a person living in an apartment in the heart of downtown and their different experiences within these areas.

The third aspect of the survey was focused on their experiences with animals; they were asked what animals they encounter in their area (stray dogs, cats, squirrels, skunks, raccoons, pigeons, other kinds of birds, coyotes, among others), then they are asked their thoughts on these animals: if they enjoy coexisting with them, if they do not really mind coexisting with them, if they consider them pests and do not like coexisting with them, or if they feel like there is not enough information on what to do when you encounter them. The goal of this aspect was to understand their thoughts on animals they encounter in their everyday life; it is important to see how they feel about the animals that can be found in the city or its surroundings.

The fourth aspect of the survey was focused on their thoughts about animals in a digital setting; they were asked if they enjoy watching animal videos and where they usually find these kinds of videos: social media, documentaries, or TV shows. The goal of this aspect was to understand how they view animals that are not in direct contact with them and if it changes drastically from the view, or opinion, they have on animals they face in real life. Finally, the fifth aspect of the survey is focused on their experience and opinion; they were asked to share a story about the time they encountered a wild animal and it went, and they were also asked to share any concern they have on encountering a wild animal in an urban setting, there is also room for any other comments they might want to share about this. This last aspect of the survey has the intention to gather more information about their experiences and allowed the subjects to give more information about their opinion.

The survey was open for one month and was answered by 53 participants. Once the information-gathering stage of this survey was complete, the primary data was organized to be analyzed. As mentioned before, this survey was made in Microsoft Forms, a platform that allowed the student researcher to easily organize the responses by both individual and collective.

It also allowed us to create some charts to visually organize the answers to some questions, which eased the analysis.

3.3. Semi – Structured Interviews

After gathering secondary data, it was clear that I would need the opinion of some experts in the different topics that were found by this method. It was determined that the most important topic that needed to be discussed with experts was sustainable urban planning, animal welfare, and animal ethics. The goal of this method was to gather their insights on the topic from their expert point of view. This allowed the project to have a greater view on what the requirements for this project must be.

For the selection of participants, the student researcher opted to look for research that had similar topics for a person who might present the desired profile, which was a person that has experience on the desired topic, whether it is by studies or by work throughout the years, and could prove their expertise by papers and / or research studies they had published. The student researcher also received some personal suggestions from their principal advisor and academics. Once a person that met the criteria was found, they were contacted by email and a time and date for the interview was set.

The interviews were around 1 hour long, and they were held in Microsoft Teams, a platform that allowed the student researcher to record the meeting for its posterior analysis. In these interviews, the only participants were the expert and the student researcher, and the data was collected both by note-taking and audio and video recording, as mentioned before. They were semi-structured with some initial questions based on their area of expertise, but it was important for the interaction not to be completely structured since it would restrain the conversation. Instead of that, the goal was to have essential data on this, as well as some opinions and suggestions that the expert could mention to enrich the project. Once the interviews took place, they were transcribed and analyzed. For the analysis, we used coding to gather the insights of each conversation.

4. Findings

4.1. Survey Results

This survey was open to the public through a poster in universities and public spaces, as well as shared through social media. After the first section that focused on personal information, the second section was focused on their living situation. They were asked if they lived in Toronto. 67% of the people who answered the survey said that they had moved to the city a few years ago, 18% mentioned that they have lived in Toronto all their lives, 4% mentioned that they used to live in the city but recently moved out, and another 4% mentioned that they do not currently live there but have visited; 8% mentioned that they live somewhere else. They were also asked in what kind of area they lived in (see **Figure 12**), 76% mentioned that they live in an urban area, and 24% mentioned that they live in a suburban area.

Urban	39
Suburban	12
Rural	0
Farm	0
Other	0



Figure 12: Area where people live

Note: Chart created in Microsoft Forms with the responses of the people that participated in the survey.

Another question was, where they live currently: in a townhouse, apartment, condominium, house, or in another structure (see **Figure 13**). 33% said that they live in an apartment, 29% live in a house, 27% in a condominium, 8% in a townhouse, and 2% in another place. Crossing the information from the previous answer, it was found that from the 39 people who said they live in an urban area, 15 live in an apartment, 14 in a condominium, 6 in a house, 3 in a townhouse, and 1 has a different living arrangement. On the other hand, of the 12 people that said they live in the suburbs, 2 live in an apartment, 9 in a house, and 1 in a townhouse.

● Townhouse	4
● Apartment	17
● Condominium	14
● House	15
● Other	1



Figure 13: Type of state people live in

Note: Chart created in Microsoft Forms with the responses of the people that participated in the survey.

Participants were also asked what kind of natural features they had near the area they lived in: parks, parkettes, valleys, hiking trails, rivers, lakes, lagoons, or any other natural area (see **Figure 14**). Most people answered saying that they have a park nearby, parkette being the second most common response. The responses were compared with the area they lived in, and it was found that, from the 39 people who live in an urban area, 36 have a park nearby, 15 have a parkette, 4 live near a valley, 7 near a hiking trail, 4 near a river, 8 near a lake, and 3 near other natural areas, such as ravines and dog parks. In comparison, from the 12 people who live in the suburbs, everyone has a park and/or a parkette nearby, 5 live near a valley, 8 near a hiking trail, 7 near a river, and 4 near a lake.

● Park	47
● Parkette	23
● Valley	9
● Hiking trail	15
● River	11
● Lake	12
● Lagoon	0
● Other	3

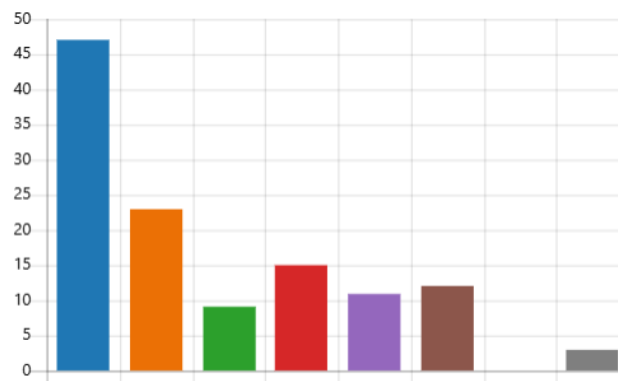


Figure 14: What kind of natural features people have near their area

Note: Chart created in Microsoft Forms with the responses of the people that participated in the survey.

Furthermore, for the third aspect of the survey, they were asked what kind of animals they saw near the place they lived in (see **Figure 15**); the most common answer was squirrels with 49 responses, followed by pigeons and doves with 40, then raccoons with 39, dogs with 31, and

waterfowl birds with 29. For this question and the following one, birds that were not pigeons and doves were divided into 4 groups: birds of prey, referring to hawks, eagles, owls, falcons, vultures, and others; waterfowl birds, such as ducks, geese, swans, seagulls, herons, and others; flow-like birds like turkeys, peacocks, chickens, pheasants, and others; and perching birds such as cardinals, sparrows, robins, mockingbirds, among others.

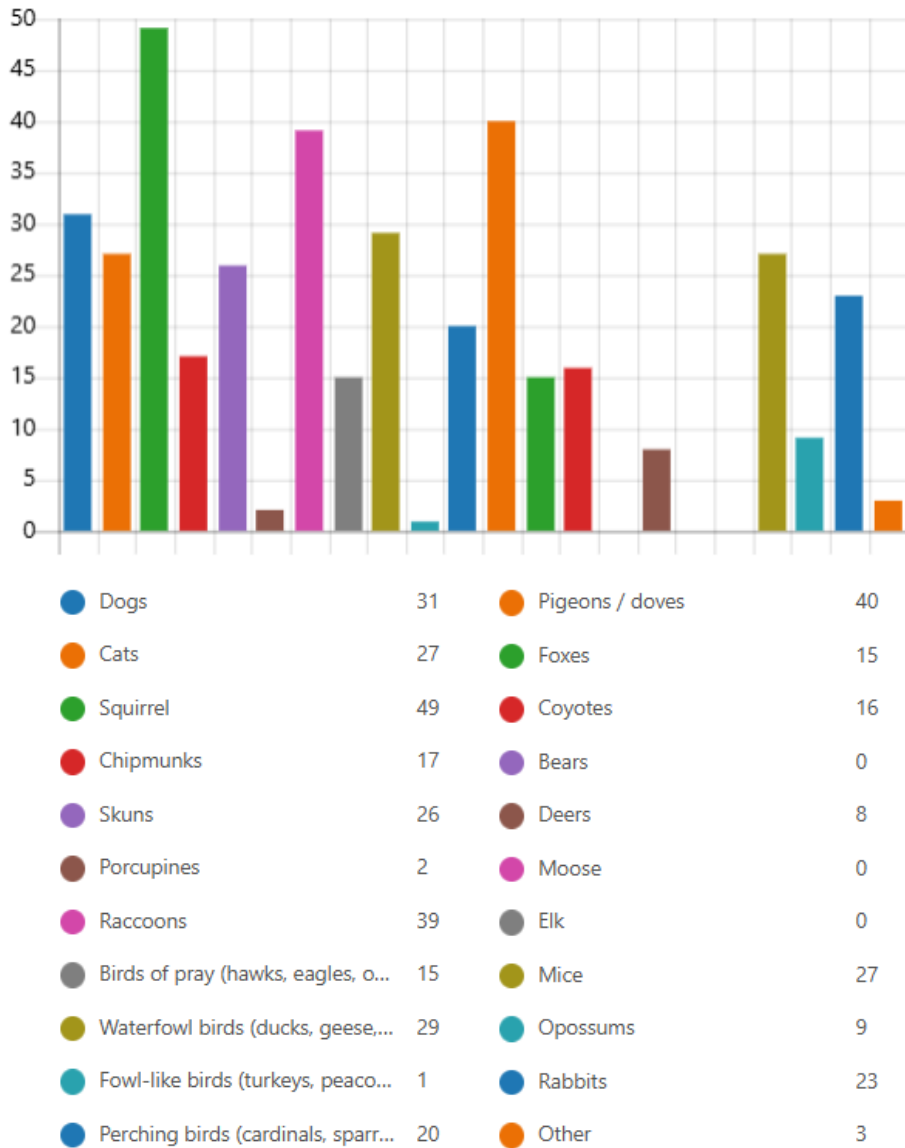


Figure 15: What animals people see in their areas

Note: Chart created in Microsoft Forms with the responses of the people that participated in the survey.

The follow-up question asked how the respondents felt about sharing urban spaces with animals (see **Figure 16**): The question asked if participants liked/loved coexisting with animals, or whether they minded sharing the space with them, or conversely whether they thought animals

were ‘pests.’ The final enquiry asked if the participant had enough information on how to act when encountering an animal in their environs.

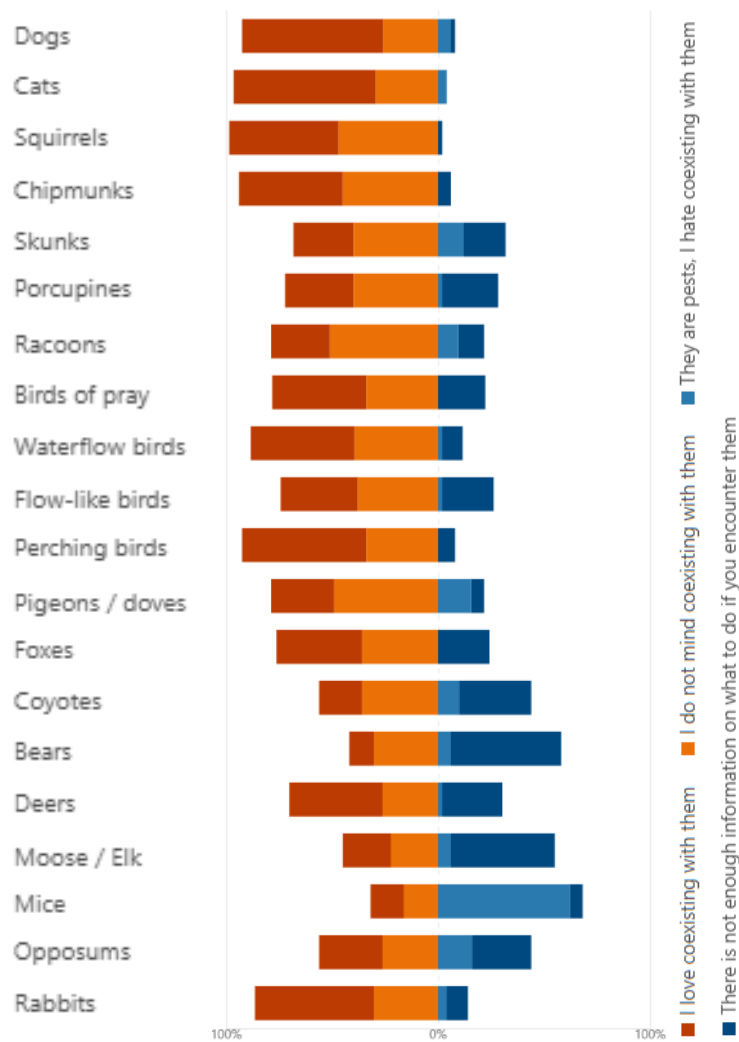
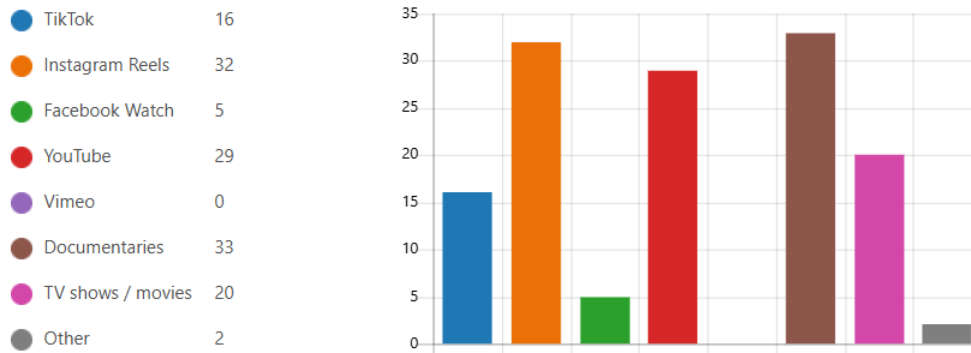


Figure 16: What do people think of these animals

Note: Chart created in Microsoft Forms with the responses of the people that participated in the survey.

For the fourth section of the survey, the focus was on how the participants felt about seeing wild animals on a digital platform rather than in real life. For this stage of the survey, participants were asked if they typically seek out videos of animals, whether wild or domestic. 84% of respondents replied that they did (43 people); 12% said maybe (6 people), and 4% said they did not (2 people). As a follow-up question, they were asked what kind of platform they used to watch these videos (see **Figure 17**). As a result, it was found out that the most common platform is documentaries with 33 votes, followed by Instagram reels with 32 and YouTube videos with 29.

Figure 17:
What platform do people use to watch animal videos



Note: Chart created in Microsoft Forms with the responses of the people that participated in the survey.

In the final and fifth section, questions asked were focussed on opinion on animals. The first one was, “How do you feel about sharing the city with wildlife?” Most people mentioned they either love coexisting with urban life, or they do not mind it. However, two people said that they do not care for wild animals. Others expressed that these spaces were originally home to many diverse wild animals, prior to human settlement. Additionally, others mentioned that they feel like there is not enough information on how to act when encountering a wild animal, so that makes them scared, especially talking about animals like bears or other carnivores. Some outstanding responses we got were:

- “I love sharing the city with wildlife; however, there are few resources made for wildlife, making it a hazard for them, reducing their population, and posing risks to them. Another problem being that people generally aren’t educated about wildlife and animals to actually coexist with them, so making it a difficult conversation.”
- “I feel like urbanization has pushed many animals out of their natural habitats, forcing them into urban areas through no fault of their own, and we should do everything we can to protect them and to coexist with them.”
- “I don’t mind as long as it doesn’t affect me negatively. Maybe that is unfair to the animals. In general, I love seeing the diverse range of animals. I think they are beautiful, and an important part of this city.”

Another question of this section was, “If you care to share, what are some of your concerns about having an encounter with a wild animal in your area?” The most common response obtained from this question was that people are afraid for their safety, and they are especially afraid for kids and pets, since they fear a wild animal can attack them. Another common response was that they fear wild animals may carry diseases, such as rabies or distemper, that can be a hazard to humans, children, and pets. Others mentioned that they are afraid of not knowing how to react to an encounter or if an animal attacks them. Some notable responses were:

- “People living with children and who aren’t educated about encounters have a higher risk of getting harmed by wildlife. While we are two distinct species, our behaviours are unique and must be known to encounter. Example of increasing dog bites / bear encounters/ coyotes attacking dogs on walks- all are mainly in urban settings and happening due to the reduced understanding of how to behave and act when encountered with a different species”
- “Most wild animals will choose to run away from humans rather than risk a confrontation. An exception would be if the animal is starving, and risks getting closer for an easier meal. We can minimize this by designing our urban areas to accommodate animal populations by building sheltered areas and crossing zones. Creating safe spaces for animals also keeps humans and their pets safer.”
- “My only concern would be coyotes because I have 2 small dogs, and they can be a danger to them. I don’t hate them just wouldn’t know what to do if I saw one approaching a dog.”

They were also asked, “Could you share a story about a time you met an animal? How did the encounter go? Everyone mentioned a time they encountered an animal, and they maintained a respectful distance, and the animal did the same. The stories also reflect that people enjoy watching nature from a safe distance, and sometimes that is shared with people they do not know, but that moment unites them. Some of the stories people told were:

- “I met a coyote in the summer while running through a local trail. It was sitting calmly under a tree and had no interest in approaching the humans on the trail.”
- “I saw a rabbit at night, and only later noticed that someone else, a stranger, had also been observing the same rabbit. This moment of shared experience between two strangers

observing a scene highlighted the dynamics of humans being active both during the day and at night”

- “While living in Brampton (surrounded with huge parks and trails) for 3 months, there was a time I could not sleep and would wake up early at 4am. I would go out on trails to find peace, watching birds and tiny animals going on with their lives before the worldly disturbance was surreal. My gallery is full of birds, rabbits and squirrels chomping away at their food and undisturbed.”
- “Only recently a very small mouse entered our apartment and was staying in the kitchen to take shelter. Honestly, I was scared initially but after a few days I realized it only wanted food and shelter, so I made my peace and tried co-existing with it before my housemates trapped it and threw it outside.”
- “So many times. The last summer I spent hours outside at night befriending stray cats. But in doing so, I met lovely raccoons and skunks. The raccoons were so curious and very polite to me. The skunks too. They would often walk around me if I made noise and never threatened to spray me unless I walked towards them. The skunks weirdly responded to me speaking in French but aside from that, they would take the longest path away from my direction to get where they were going and would get ready to spray me until I turned away from them and stopped moving. Skunks are beautiful and very peaceful. They don’t want to spray others; they want to avoid them.”

Finally, they were asked if they had any last thoughts and / or comments and some answers obtained were:

- “Animals are not pests. They are simply trying to survive in a world where humans are impacting their surroundings. Choosing which animals should be removed from our environments, or even killed, is speciesism. Animals are not ours to use or abuse in any way, but we can be their custodians and protectors.”
- “I wish there was more awareness and info in public about how to respond in such situations with various animals and how to peacefully co-exist with them.”

4.2. Interview Results

Three interviews were held with experts from three different areas: wild animal welfare, urban planning, and animal ethics.

4.2.1. Interview With an Expert in Wild Animal Welfare

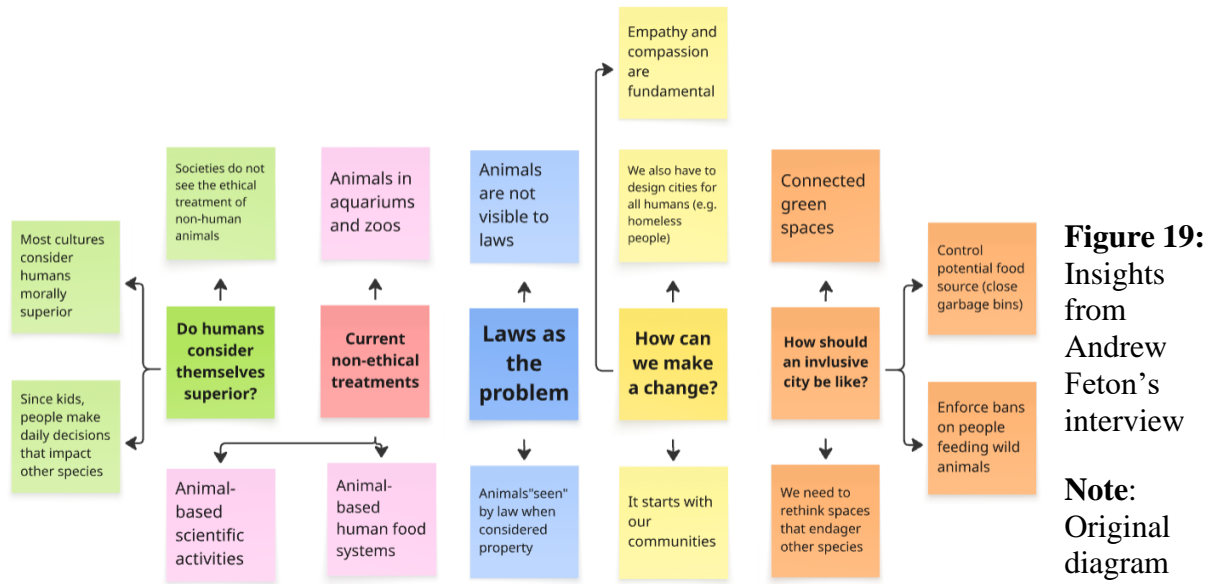
The first interviewee was Erin Ryan, the wildlife campaign manager of the World Animal Protection organization. Ms. Ryan holds a BSc and MSc in Applied Animal Biology and is also a proud member of the Syilx (Okanagan) Nation (for more information about the organization, visit their webpage at <https://www.worldanimalprotection.ca/>). This interview was focused on the expert's opinion on wild urban animal's welfare in the city and how she thinks this can be improved. From the beginning of the interview, it was determined that the current urban planning strategies made it difficult for animals to live in.

“They [wild urban animals] face a lot of hardships in urban areas with increasing density, increasing human contact. (...) It's a tough life in the city, but they've shown incredible resilience.” (Ryan, 2025).

For this to be minimized, humans must learn how to coexist correctly with animals that share the same living spaces. “We have to recognize that this is their home too, and we have to learn ways that we can coexist in a way that's mutually agreeable to both of us.” (Ryan, 2025). Additionally, it was also stated that learning how to coexist with animals is particularly important, especially given the changes the world is currently going through, which affect every being. “What we're seeing with climate change is that things are changing, and animals are trying to adapt, so we may see new species or sub populations moving into [urban] areas.” (Ryan, 2025).

4.2.2. Interview With an Animal Ethics Expert

The second interview was with Dr. Andrew Fenton, philosophy professor at Dalhousie University. He holds a BA, MA and PhD in philosophy and his areas of expertise are animal (bio)ethics, naturalized epistemology, and the philosophy of animal behaviour and cognition. (For more information on his research work, visit his webpage at: <https://andrewfenton.ca/>). The goal of this interview was understanding all the ethical considerations that had to be taken into consideration while designing a space for animals and humans to coexist safely.



This interview aimed to understand the ethical considerations needed for a city that not only has humans as the stakeholders but also is designed for animals. To start approaching this, it was discussed why humans feel like they are superior to any other beings, to which it was concluded that it a common cultural believe, most cultures converge on human supremacism. Which is reflected from an early age in people, humans have always been surrounded by animals, and from very young ages they have made decisions that affected them (playing with worms in the yard, for example).

To change the mindset, it is important to start from communities, common ground for humans and animals should be created, and conflicts resolved. But again, this starts from each person's own societies, and empathy or compassion are huge factors in coexistence, even with other humans. Currently, cities are not considering ethical treatment of non-human species, some examples of this are zoos, aquariums, and even animals used in laboratories for experiments,

which are not being treated ethically. “Fundamentally, a significant part of the problem is legal. At present, other animals are not “visible” to law in ways that humans are, and that’d need to change before we’ll see significant positive societal changes, at least from my perspective.” (Fenton, 2025). Animals are “seen” and protected by law only if they are seen as property: pets, or even livestock. But animals should also be given a legal status as individuals. Education and dialogue are a terrific way to change people’s minds on this.

The final topic discussed during the interview was how to make an animal-inclusive city, to which the interviewee mentioned: “Minimally, we need to rethink urban practices that endanger other animals.” (Fenton, 2025). For this, it is necessary to have several green spaces connected with each other for animals to navigate in safely, and escape from humans. Another important aspect is an adequate control of potential food sources, such as garbage bins, that should be properly closed and regularly emptied. Lastly, the government should enforce bans on feeding wild urban animals; animals cannot think of humans as friends for their own safety, and by feeding them, people are inviting them to approach, which will endanger them.

4.2.3. Interview With an Urban Planner Expert

The final interview was with Nicolas Koff, co-founder of Office Ou, an award-winning architecture, landscape, and strategy office with projects based in social impact and environmental sustainability. He holds a BA in architecture studies and a dual M. Arch and MLA (for more information on the office, visit their webpage at: <https://www.office-ou.com/>). The purpose of this interview was to gather the expert’s opinion on current inclusive urban planning strategies and some strategies to improve this.

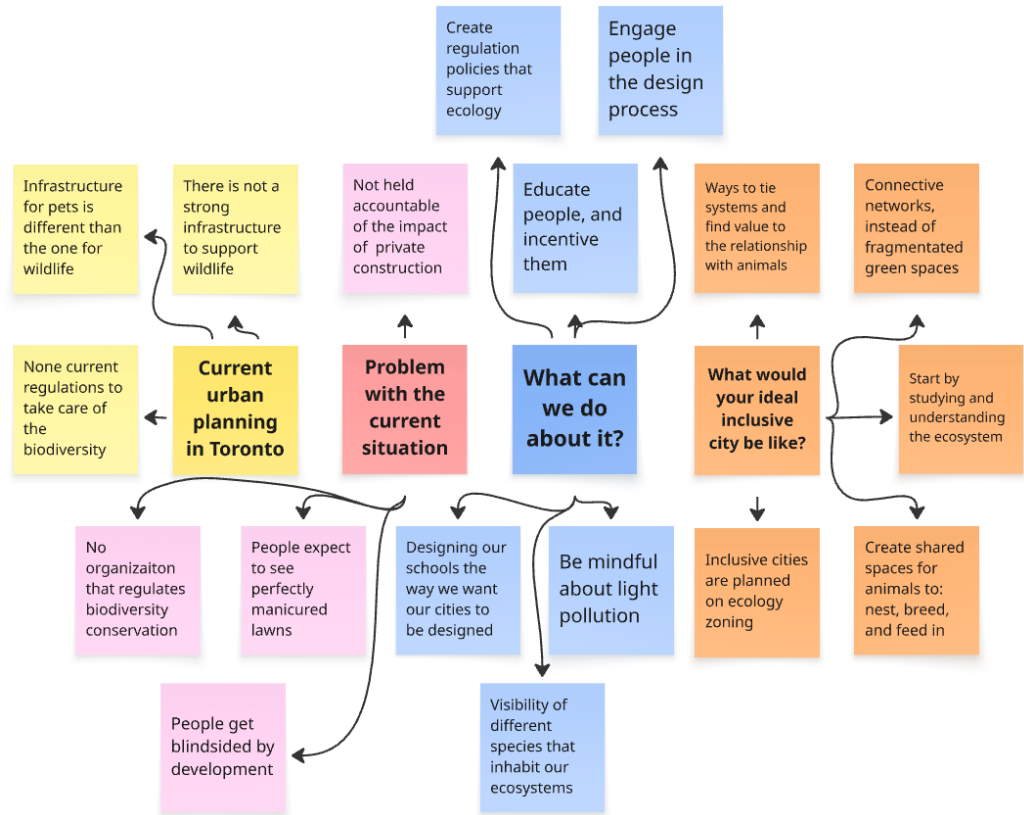


Figure 20:
Insights
from
Nicolas
Koff's
interview

Note:
Original
diagram

To start the interview, it was important for the researcher to know what the expert considered to be the most important aspect of urban planning, to which the interviewee explained that this practice has different layers and that they are all equally important, and animals are also part of such layers playing an important role in our ecosystem. Another insight it was important to obtain was the expert's opinion on whether Toronto was designed including the animals in the layers, to which he answered, "Yes and no. (...). I don't know that we have an extremely strong infrastructure to support urban wildlife, but as a city we are fairly lucky to have access to a fairly good amount of green spaces." (Koff, 2025).

Other strong insights obtained from this interview were that he does not consider that the City of Toronto has enough existing policies to take care of biodiversity in the area.

(...) the city enforces a certain amount of soft landscaping, green spaces, certain amounts of infiltration space. So certain ways to deal with water runoffs. But honestly, none of it is sufficient for a point of view of building biodiversity and ecological spaces. Those are not really part of the mandate. (Koff, 2025).

The lack of stronger policies is a hazard for the environment given since urban planners are not required to include biodiversity friendly spaces in their designs and there is nothing that stops them from including invasive species of fauna in their designs that will ultimately end up hurting pollinators, and the overall ecosystem of the area.

Another central topic discussed during the interview, was how can cities be inclusive. The strategies were divided into two groups: policies and infrastructure. For the **policies**, education is one of the main actions that must be taken, and the other one is creating a more inclusive urban design process. “If you don't feel like you're welcome in this process, of course you're not necessarily going to care about it.” (Koff, 2025). Creating incentives for the community will motivate them to getting involved, which is a great first step. Another policy project mentioned was to design schools the same way people want cities to be designed: with a lot of green spaces, with native species and with proper education of children, since the younger they get educated on this matter, the better.

On the other hand, some **infrastructure changes** that should be adopted are being more careful about the selection of flora species selected while building green spaces, it is better to have native species not to disrupt the environment. People should be careful of the light pollution, minimize harmful runoffs, and to design while thinking about the less obvious species, or species that usually get stigmatized. “We should be more careful about many things that could have a huge impact on the wellbeing of these species and, as a result, of the biodiversity and our environment.” (Koff, 2025). Another infrastructure change that should be adopted is creating a patchwork of habitats and connective networks for animals that can travel around green areas that have spaces for the 3 vital stages of their lives: nesting, breeding, and feeding.

The final question asked in this interview was an inclusive city, to which he mentioned that, for him, this city is not planned based on land zone use but on an ecology of zoning. And a good option to start on this is by studying the area and understanding it before any project, to learn how to preserve its biodiversity. “(...) you need to start with the ecology, (...) studying the ecosystem, and that must be part of the analysis of every site. Understanding the ecosystem and (...) all the stakeholders that play a role in it” (Koff, 2025).

5. Discussion

Although Toronto has a lot of green areas and several wild urban animals, it is not a completely inclusive city. The survey showed that most of the people that live in downtown Toronto only have parks or parkettes nearby, whereas people that live more towards the suburbs have larger green spaces such as hiking trails and creeks. It was also found that people in the city coexist with several wild urban animals and that the most common ones to find in Toronto are squirrels, doves and pigeons, and raccoons.

Most people agree that animals are an important part of our ecosystem and even enjoy sharing spaces with them. They are, however, that wild animals can represent a hazard to people such as coyotes, raccoons, and skunks, among others, as this wildlife has capacity for significant encounters or disease. Nevertheless, according to the encounters they have described thus far, most are peaceful provided city dwellers can maintain a respectful distance. Many respondents enjoy seeing videos of animals on several platforms and even enjoy seeing them in real life without interfering.

People already have a relationship with animals, but most of the participants feel like there is not enough information on how to coexist with them and that there are not enough adequate spaces for them. This was also mentioned by the experts, who agree that Toronto has several green spaces, but its planning was not designed with wild urban animals in mind. They also mention that there are not enough policies or guidelines to remediate this. To have proper guidelines for inclusive cities, two different areas must be faced: government policy making and infrastructure. For this research, the proposed guidelines will be divided into these two groups, and a third one will be added to address animal health and welfare.

5.1. Proposed Guidelines for an Inclusive City

5.1.1. *Infrastructure and Planning*

As mentioned by all three experts, improving the infrastructure of a city is important to maintain the biodiversity.

1. Blue and green areas: Cities must have several green spaces for animals to live in, such as urban forests; these areas should be protected and must have access to food and water.

These areas must be connected all throughout the city for animals to be able to relocate and move in.



Figure 21:
City with blue
and green
areas

Note: Image
generated with
ChatGPT 4o/
DALL·E.

2. Animal crossings: To connect all these green spaces within the city, animal crossings are necessary to minimize the risks of runoffs. Roads and highways must have animal crossings, either over or underpasses, that unite green spaces. And, in the case of smaller streets, proper signage for areas where animals are more common.



Figure 22:
*Wildlife
crossing*

Note: Image
generated with
ChatGPT 4o/
DALL·E.

3. Bee-friendly buildings: Buildings should also have been bricks or bee hotels for pollinators that travel through the area. These buildings must also have access to proper sources of food of native species of flora.



Figure 23:
Bee-friendly building

Note: Image generated with ChatGPT 4o/ DALL·E.

4. Bird-friendly buildings: Buildings that are taller than 5 stories must have windows with visual cues for birds to minimize the risk of collision. Additionally, buildings should have bird bricks and/or cavities for birds to have room to nest. These should be directly proportional to the quantity of units in the building.



Figure 24:
*Building with
bird boxes*

Note: Image
generated with
ChatGPT 4o/
DALL·E.



Figure 25:
*Building with
visual cues for
birds*

Note: Image
generated with
ChatGPT 4o/
DALL·E.

5.1.2. Government policies and Community Involvement

- 1) Food waste: Citizens must adequately discard their waste. Garbage bins should be equipped with secure lids to prevent animals from accessing the contents. The lids must be properly closed, and they must be taken to the side of the road for its pickup early in the morning.



Figure 26:
Properly closed waste bins

Note: Image generated with ChatGPT 4o/ DALL·E.

- 2) Education: The city authorities are responsible for educating its inhabitants. Education campaigns should be held regularly and with the help of social media. Signage with proper information in green spaces to inform people.



Figure 27:
*Park with
proper
educational
signs*

Note: Image
generated with
ChatGPT 4o/
DALL·E.

- 3) Respectful distance: People should maintain a respectful distance from animals. The city authorities should ensure that animals are not attacked by humans randomly with stronger punishments.



Figure 28:
*Respectful
distance
between
people and
animals*

Note: Image
generated with
ChatGPT 4o/
DALL·E.

5.1.3. Biodiversity Conservation and Animal Welfare

- 1) Native species: The flora of the city should be native to the area to make it sustainable and avoid invasive species –of both flora and fauna. Parks and green spaces should be

designed with proper research to ensure this. For this, proper research of the area must be made to understand the ecosystem and the species that inhabit it.



Figure 29:
*Native flora in
the city*

Note: Image
generated with
ChatGPT 4o/
DALL·E.

- 2) Minimize light pollution: Cities should minimize the brightness and quantity of artificial light at night, especially during migration seasons, to avoid confusing migratory birds.



Figure 30:
*City with low
light pollution*

Note: Image
generated with
ChatGPT 4o/
DALL·E.

- 3) Animal health: The city authorities should carry out campaigns to nurture and deworm animals. Medicine can be distributed by feeders, similar to the OvoControl project, located in green spaces and designed for the animals that are usually located within the area.



Figure 31:
Feeder for squirrels for health campaigns

Note: Image generated with ChatGPT 4o/ DALL·E.

- 4) Habitats: The expansion of the city should not be a hazard for animals that inhabit the area. They should not be displaced, nor should their habitats be destroyed, and the natural resources must be taken care of.



Figure 32:
Respecting habitats

Note: Image generated with ChatGPT 4o/ DALL·E.

6. Conclusions

Animals are an integral part of human life, whether through physical presence, cultural symbolism, or their roles as beloved figures in fiction, most of children's books or stories have animals as the main characters. Several kids' movies celebrate talking animals and this creates a relationship built on imagination that should be carried throughout real life. People also feel a strong connection with their pets, independently of their species. The work "Kahu" in Hawaiian means guardian, protector of something that is cherished. The term can be applied in many different contexts: someone can be guardian of their family, their culture, their land, of the environment, and most recently, it has been used on social media to describe pet owners. "This concept is relevant to pet ownership as well. Treat your pets as cherished companions and take on the role of their guardian, ensuring their well-being and safety." (Blanco Ledesma, 2023). The term eliminates the idea of ownership, people are not seen as owners of an animal but as someone who was entrusted with the safety of another being as equally as important.

Henry Salt has been writing about this for many years, and the way people see animals has not changed. To be more empathetic and compassionate enough to care about including animals in urban areas, people should stop seeing properties, or as inferior beings whose lives are subject to human control. This, of course, opens many other discussions, such as how ethical it is to breed animals for sales, or to have animals in zoos, aquariums, and even circuses. Animals are not in this world to be dominated by people nor to entertain them. Fauna is as important in the ecosystem as humanity and even have the same wants and needs of survival.

In addition to this, the language is another factor that influences the relationship between humans and animals. One big example of this is the use of expressions derived from animal characteristics, such as: 'I am as busy as a bee,' which conveys the idea that bees are constantly working and the speaker is similarly busy; or 'I pigged out,' which references the tendency of pigs to eat excessively, and relating that to the speaker having eaten a large amount of food. Expressions like these reflect a similarity between human and animals' actions.

On the other hand, language can also be used to distance oneself from animals, and even make them look like a hazard, e.g., the way news describes fatal animal encounters giving most of the responsibility to the animal who is only defending their territory influences how that animal is viewed. It was mentioned by Brookshire (2022), people can see animals through a

different lens depending on their experience with them, so it is all about perception and the language used plays an especially important part in it.

Words can excuse horrible actions; they can deceive; they can incite fear, hatred, or apathy. But words can also evoke compassion and empathy and build bridges between worldviews through shared understanding. It's my belief that we can contribute to an emotional and behavioral shift among humans by replacing euphemistic language with words that better represent the true nature of our relationships with animals and ecosystems. (Weiss, 2025).

As stated, Toronto is a city that has a lot of green areas, and it is a great basis for a wildlife – inclusive city, but the work is not done with only that. For cities to be more inclusive, they should follow some guidelines. This project proposes some initial guidelines to start the dialogue, but these are not necessarily for new cities; they can also be adopted by existing cities. The proper way to start is by researching the biodiversity of the area, its native species (both flora and fauna), and their needs. Moreover, there will not be guidelines that are 'set in stone,' no one model that can be applied to every city in the world. They will change depending on many factors, but it is important to have the involvement of the community to successfully be more inclusive.

Another aspect that influences strongly on the perception people have on animals is culture. Diverse cultures have different relationships with animals and nature. For an example, Indigenous population in Peru, once revered animals as gods or deities, and the most important animal god as 'Inti' a sun god in Queehua. "The Inca civilization, (...), was deeply connected to its mythology and religion. Spirituality was a central part of the Incas' everyday lives. Their beliefs included many gods and spirits that reflected their close relationship with nature and the universe." (Coronel & Huamán, n.d.). As the Incas, and other cultures have a unique perception of nature that people can learn from to have a smoothest coexistence. Indigenous communities in Canada have an interesting relationship with animals and nature that is based in mutual respect. As future work, it would be interesting to learn about this relationship and understand it better to apply some of those practices to other communities.

To conclude this research, it is important to remember that inclusion is not a one-time job, on the contrary, to be inclusive people need to be in constant adaptation and change, it is an

ongoing work. Cities will continue to grow, new species will come to urban areas, but the one thing that will not change is the importance of learning how to coexist with others, whether they are from the same species or not. Every being is equally a right owner of the land they live in.

I hope that there won't ever be a time where we're done being animal friendly. I think it will just be a continual process of saying “what can we do better?” as we learn more and as our ecosystems change, and as our knowledge of species change. I hope that we're just continuing a process where we're asking what we know and how can we do better, based on what we know. (Ryan, 2025).

Coexistence is not only possible, but it is a necessity. To find the balance in sharing the cities, people need to divorce from the human centered design and aim to spaces that are designed for every being that inhabits it. To start changing people's approach, it is important to have room for discussions and dialogue on the matter.

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