SYNANTHROPIC SUBURBIA

by

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I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis including any required final revisions, as accepted by my exminers.

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ABSTRACT

Animals are invading the city. Coyotes are sighted on downtown streets with greater frequency, raccoons notoriously forage through greenbins as their primary source of food, and all forms of animals inhabit the surfaces, edges and cavities of the built environment. Once wild animals are now adapting to the urban ecosystem and a new human animal relationship is emerging. Between the domestic and the wild are the synanthropic species, defined as animals who benefit from living in close proximity to humans yet, remain beyond their control. Since these animals are neither beloved pets, nor wild beasts, synanthropes are often deemed pests. However, they are the urban mediate, capable of living alongside the pervasive human population by adapting to anthropogenic behaviours and environments. As the conceptual division between city and nature dissolves, architecture is called upon to negotiate the physical boundary between human and synanthropic animal. *Synanthropic Suburbia* therefore reimagines human animal interactions, using architecture to structure hybrid relationships that positively contribute to the urban ecosystem.

The thesis is positioned within a landscape of rapid ecological transformation – the suburbs – and engages the space of greatest tension between human and animal – the domestic territory of the house. The objective is to explore the potential for architecture to incorporate habitat support into architectural form and landscape systems. The research and design methodology investigates the interrelationship between scales of design and ecological impact. How can the multiplication of small scale, architectural interventions influence large scale territorial systems and patterns? *Synanthropic Suburbia* seeks to answer this question through a series of telescoping design experiments that position six animal species as active players by engaging their habitat requirements, biological behaviours, and seasonal patterns. Three architectural prosthetics re-imagine conventional building components into hybrid systems that augment the single family home and define the physical interface between human and non-human species. The multiplication of the prosthetic systems engages the broader biological requirements of a species and integrates the spatial development patters to define new synanthropic suburban typologies. These syn-urban building blocks are then proliferated across the territorial scale to create a robust, novel ecosystem that is capable of supporting a diversity and density of human and non-human species. The design process seeks to unpack the interconnectivity between complex socio-ecological systems through the multiscale design of the suburban biome.

In the current context of global urbanization and socio-ecological change, *Synanthropic Suburbia* takes the opportunity to restructure human biological and cultural relationships with non-human species. Animals are now equal citizens with the agency to contribute to the dynamic processes of production, consumption and inhabitation of the syn-urban biome. Synanthropic architecture blurs the spatial definition between human and non-human to maximize the mutual benefits of cohabitation. Eventually human perceptions could shift and more hybrid conditions of human-animal living could emerge, yet, one question will always remain, *how close is too close?*

ACKNOWLEDGMENTS

I began this thesis process with an open mind, a notebook full of questions, and a desire to establish my position within the realms of architecture and ecology. It is only through the academic mentorship, emotional support and constant encouragement of the Waterloo Architecture community that this thesis has emerged as an animal saturated document. Thank you to my supervisor, Lola Sheppard, for challenging me back in second year to interrogate and re-imagine the convergence of the built and natural environment, raising questions that continue to inform my academic pursuits to this day. I am grateful for her critical insights, abounding support and constant conversation which has guided this posthuman process. Thank you to Matthew Spremulli—whose contributions far surpassed all expectations—for influencing the suburban aspects of this thesis, and providing unrelenting encouragement to always think more critically and act more radically. To my committee member, Robert Corry, for his valuable insights into the expansive and complex realm of landscape ecology which brought greater depth to each of the design experiments. And to my external reader, Joyce Hwang, for the intriguing conversations into this unusual realm of animal architectures.

Thank you to my family for their unwavering support, especially to Joel and Lindsey for loaning their house a few bats. To my companion, friends and colleagues who have humoured my animal fascinations over the past year, I am lucky to have had you. Especially Piper, for her humour and wisdom which has sustained me throughout this entire experience. And finally, thank you to everyone I had the opportunity to collaborate with through BRIDGE, Re:POST, exhibitions and TA-ships for teaching me things not embodied in these pages.

To each of the animals who I have come to know through research and encounter.

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INTRODUCTION

Synanthropic Suburbia is an experiment in ecological architecture design thinking. It explores how architecture can generate positive effects within the ecosystems around it by engaging the tensions between human and non-human species. The thesis asks, how close is too close, when cohabiting with animals species in the built environment? To test the boundaries between the acceptable and the perverse, the design experiments are situated in the site of greatest tension—the domestic realm of the house—and in the place of rapid ecological transformation— the North American suburbs.

The thesis positions the synanthropic animal, a species which benefits from living in close proximity to humans, as the focal point for the research. An understanding of the animal, its behaviours, associated environment, and biological requirements provide the foundation for the design speculations. The design objective is to investigate how small scale, architectural interventions can influence large scale, territorial patterns. Can the multiplication of a synanthropic architecture generate a positive ecological impact on a larger ecosystem? *Synanthropic Suburbia* attempts to answer this question through the development of architectural scale prosthetics which are multiplied to form community scale typologies that are then applied across a prototypical suburban territory. The design process seeks to unpack the interconnectivity between complex socio-ecological systems through multiscale design.

The thesis is structured into five parts which increase in scale from subject, to assemblage, to territory. *Part One: Animals & Architecture* provides the theoretical foundation which underscores the research and design. It is structured into three essays which teliscope outwards from specific to contextual. The first essay, *Knowing the Synanthrope*, examines the relationships between humans and animals to identify new types of interactions. *Defining Limits,* then unpacks how interactions between humans and synanthropic animals are structured, identifying the physical interface as a site of design opportunity. The third essay, *Agency in the Urban Biome,* defines the city as an ecological habitat within which synanthropic architecture has the potential to influence the form and function of the built environment. The set of essays serve to define the thesis position.

Part Two: Urban Bestiary delves into understanding the cultural position and biological perspective of the animal. It is structured after a medieval text, a bestiary, which aggregated all knowledge, scientific or cultural, surrounding selected animal species. The *Urban Bestiary* is a compendium of synanthropic beasts which expands human understanding of five common urban animals. It illustrates cultural and historical narratives, and defines biological relationships and animal habitats to piece together a portrait of the House Sparrow, the Brown Rat, the Feral Pigeon, the Common Raccoon, and the Peregrine Falcon. The objective is to come to know the animal and understand the synurbization process through which they adapted to the city.

Part Three: Between Species investigates how the design of physical interfaces can structure productive relationships between the suburban homeowner and their animal neighbour. Three synanthropic prosthetics reimagine conventional architectural components and are designed to engage six species with varying degrees of suburban adaptability and human tolerance. The Compost Chimney prosthetic employs the dexterous Common Raccoon to aerate compost within a chimney structure that also provides habitat for the Chimney Swift. The Extended Eave prosthetic reconfigures typical roof drainage and exhaust systems to provide nesting sites and biological requirements for two at risk bird species, the Eastern Bluebird and the Tree Swallow. The third prosthetic creates habitat opportunities for the Barn Owl, Brown Bat and the suburban homeowner within the Habitat Dormer. The three prosthetics attach onto the prototypical single-family house and structure new interspecies relationships.

Part Four: Syn-Urban Assemblages expands in scale to contemplate the landscape ecology of the suburbs. A set of community-scale design guidelines structure the implementation and multiplication of the prosthetics to develop new typologies for the synanthropic suburb.

Finally, *Part Five: Territorial Synurbization* speculates on the potential for holistic planning of synanthropic suburbs by leveraging legislated planning acts and official city plans. It tests the potential of synanthropic design by strategically applying the syn-urban typologies onto a prototypical community at the urban periphery. The objective is to not only fortify existing systems but to cultivate new ecological opportunities within the suburban biome.

GLOSSARY

anthrome
noun
a human biome created by sustained, direct human interactions with an ecosystem

anthropogenic
adjective
of, relating to, or resulting from the invluence of human beings on nature

bestiary
noun
a compendeum of beasts depicting through elaborate words and illustration the nature of plant and animal species. Neither wholly fact nor fiction, neither zoology or religion it described the world as we knew it, full of allegory and science.

biome
noun
a large, naturally occurring community of flora and fauna occupying a major habitat

control
verb
the act of influence, regulation, or constraint over behaviour or course of events, imposition of authority over *the other* to maintain a desired status

domesticate
verb
to manipulate a living organism at a genetic level through selective breeding, rendering it reliant upon humans for survival and therefore incapable of living independently in the wild

invasive
adjective
foreign species, alien to a particular ecological system in which it can establish a self-replacing population over several life cycles and as a result may spread prolifically, undesirably, even harmfully across long distances.

limit
noun
an edge, boundary which delineates what is permissible from what is perverse, can take physical form as a structured boundary or function as a conceptual territory

novel ecosystem
noun
human-built or modified environments that have been transformed from an pre-existing state through anthropogenic processes

perception
noun
a mental impression which informs how something is regarded, understood or interpreted, an ability to see, hear or become aware of something through the senses

synanthropic
adjective
describes a species of wild animal or plant which live near and benefit from association with humans and their built environments which form "artificial habitats" such as houses, gardens, farms, roadsides, garbage dumps, etc.

wild
adjective
to live or grow in the natural environment, refers to plants and animals that are neither domesticated nor cultivated; uncontrolled, uninhibited actions
a natural region, unaltered by human intervention

part one

ANIMALS & ARCHITECTURE

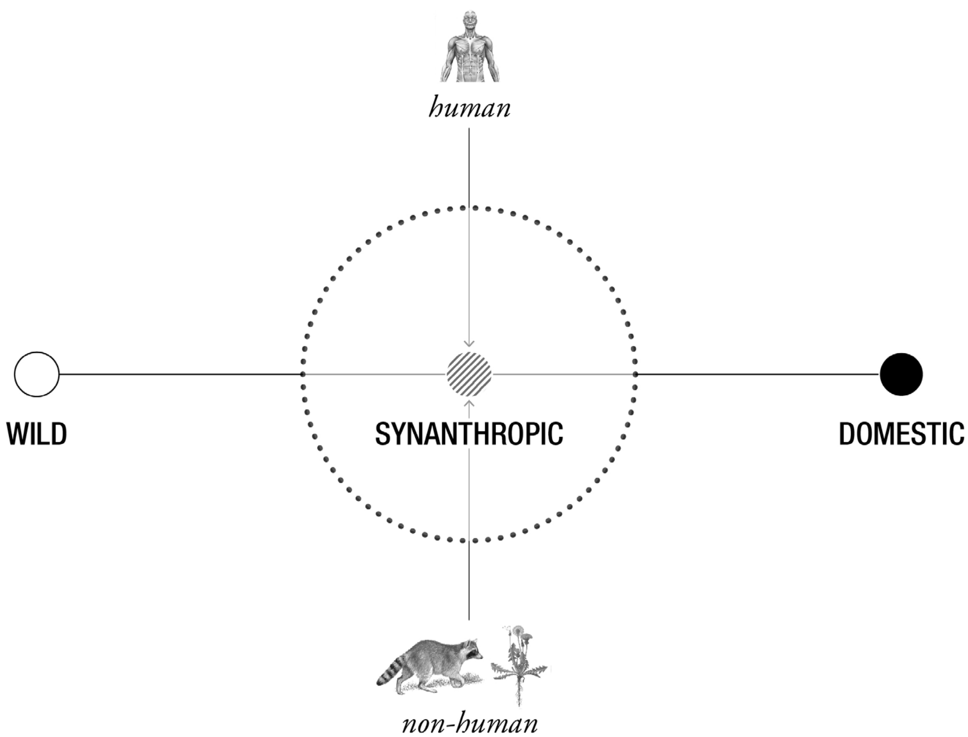


Fig. 1.1. Gradient of Human Animal Relationships

essay one

KNOWING THE SYNANTHROPE

Between Domestic and Wild

Humanity defines animals by their relationships to humans. Through this lens non-human species are categorized into two forms; domestic – dependent on humans for survival and augmented to live as companion species to humans, and wild – independent of humans, capable of sustaining life without anthropogenic support. These relationships are based on the level of human intervention into an animal's ability to survive. Domestic species are further defined by the type and degree of human intervention, for example the neutralization of animals into pets, capitalization of animals as a human resource in the form of livestock, and aestheticization of animals as a form of human entertainment.

def'n . anthropogenic
of, relating to, or resulting from the influence of human beings on nature

Alternatively, the independence of wild animals has always instilled fear and reverence for the unknown *other* into human culture. These species, who remain outside the boundaries of civilization, have come to be associated with idealizations of the landscapes which support them. They are engrained into humanity's conception of nature as a pure condition that is unadulterated by anthropogenic actions. Traditional conservation practice attempts to preserve the state of the wild and protect it from humans by delineating conservation reserves and national parks for animal inhabitation. However, these efforts by ecologists to maintain definition in the human / nature dichotomy ultimately erode the boundaries and produces hybrid conditions. According to Lefebvre, by delineating the "forest" or the "park" on a map and defining them as a space for animals, humans are inadvertently urbanizing the wild landscapes of the world.[1] Biologically, the human animal relationship established through preservation and restoration practices creates a condition of "conservation reliance" as termed by biologist J. Michael Scott in which "[humans] are gardening the wilderness," and as a result, "[t]he line between conservation and domestication has blurred."[2] Society is gradually relinquishing absolute definitions of human animal relationships to allow for gradients between complete reliance and total independence.

def'n . synanthropic
ecologically associated with humans

The synanthropic condition lies within this emerging gradient. It defines species which are between the domestic and the wild, who benefit from living in close proximity to humans yet remain beyond their control. The synanthrope has evolved to the patterns of transformation, consumption, and production exhibited by human civilizations. As a result, these opportunistic species have thrived and proliferated alongside human geographic expansion. They are most abundant in city landscapes where they occupy the streets, buildings, and infrastructural systems established and inhabited by humans.

The ecological role and cultural value of synanthropic species is nebulous; varying by individual, situation, and context. For humans who occupy the city, the majority of their animal encounters are with synanthropic species like pigeons, squirrels, sparrows, and raccoons who also inhabit the urban environment. For many, these overabundant animals are an unwanted pest. In response, property owners install pigeon deterrents that discourage the unwelcome animal neighbours from perching on building ledges or nesting on roof edges. Yet, in certain circumstances synanthropes can become an enjoyable novelty due to their excessive population or unusual behaviours. Take for example the massive population of pigeons who occupy Piazza San Marco in Venice and have become a tourist destination in themselves; or the raccoon who was captured on video traversing telephone wires in a Toronto neighbourhood, becaming an adorable news and social media sensation. A select few, often marginalized people, treat synanthropes as a companion species take for example the elderly and homeless who frequently feed pigeons in public parks. On rare occassions, humans express empathy for synanthropic species. This generally occurs when an animal is found injured or deceased as was the case with a dead racoon who was memorialized on a sidewalk in Toronto. Most of the time, synanthropic animals are simply overlooked.

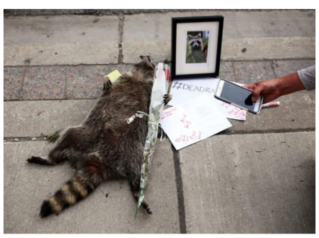


Fig. 1.2. Dead raccoon memorialized on a sidewalk in Toronto.

For the majority of city dwellers, these synanthropic animals are part of an inconsequential background to their daily urban existence and barely elicit an emotional response beyond indifference. When they do, it is often feelings of annoyance or occasionally fear that a synanthrope might come too close. Synanthropes ultimately violate the human conception of the city as a place without nature. Within the hybrid condition of the city, humans have not fully embraced synanthropic species as cohabitants, and despite human efforts, the animals cannot be expelled, only held at a distance.

Synurbization Process

Urban development is creating opportunities for these species to adapt to the city. The rapidly transforming urban landscape creates "ecological vacuums" that provide opportunities for species with high behavioral, demographic, and ecological plasticity to establish populations.[3] This ability to adapt and establish a commensal relationship with humans demonstrates that micro-evolutionary changes can occur within species over short time scales.[4] Previously, a species' behavioral and ecological conditions were established over the course of 1-500 million years, however contemporary synanthropic species have successfully adapted to urban environments over the course of the 200 year history of urbanization. Maciej Luniak has defined this process as *synurbization,* the adjustment of wild animal populations to specific conditions of the urban environment.[5]

The synurbization process has enabled several bird and mammal populations to colonize cities, often with greater success than in their natural environment. This is because the urban environment offers a habitat with reduced predation risks, protection from climatic stresses, and year-round food abundance. Therefore the urban environment has a higher carrying capacity than that of wilderness habitats.[6] The anthropogenic conditions of the city also alter specives' behaviours generally resulting in higher density populations, reduced territories and migration patterns, extended breeding seasons, changes in foraging behaviour, increased interspecies competition, and greater tameness towards humans.[7] Novel conditions also encourage species to act with ingenuity; to occupy unconventional building structures, appropriate human discarded materials for nests, and exist predominantly off of human refuse. Take for example the crows in Japan who weave stolen metal coat hangers together into nests, the raccoons in Toronto who have developed clever techniques for opening compost bins, or the birds who use cigarette filters to not only construct their nests and also ward off parasites.[8] By capitalizing on the opportunities presented within these novel ecosystems, birds and mammals are gradually adapting to urban life.

Fig. 1.3. Crows nest constructed with clothing hangers.

Fig. 1.4. Birds nest using discarded cigarette butts.

However the synurbization process is not without consequences. The anthropogenic form of the city is currently only inhabitable by a limited range of species which decreases its ecological diversity.[9] In addition, limited predation and competition means generalist species proliferate with increased life longevity but often with reduced health qualities. The absence of predators allows weak and sickly species survive longer and with greater susceptibility to disease. While synurbization provides opportunities for animals to occupy new territories, it does not replace the necessity for a diverse range of native habitats.

Species Perception

It is evident that synanthropic species, unlike humans, perceive the city as a site of ecological opportunity, not degradation. The cultural dichotomy established by humans between city and nature does not exist for the non-human species who occupy the city. Instead they seek opportunities to successfully inhabit and reproduce wherever possible, regardless of whether the environment was constructed by human or non-human natural processes.

Posthuman thinking pursues an understanding of the alternative perspective of the animal and begins to dissolve the nature / city dichotomy in favour of new synthetical forms. It opposes the autonomy of the human and instead embraces the differences inherent in the other; allowing for a multiplicity of perspectives and conditions which expand human understanding of the physical world. Within this framework, the concept of "being" extends to include all biological and technological hybrid conditions.

Jakob von Uexküll, a German biologist of the 19th century, explored questions of species perception. He developed the theory of the *umwelt*, defined as the perceptual world in which an organism exists. According to Uexküll, a species' environment and actions are proportional to the organism's own complexity. When directly translated from German, *umwelt* means *environment* but has also come to imply *milieu, situation*, *embedding*, or a *"self-centered world"*. Through his research, Uexküll catalogued detailed behaviour analysis of animals to determine their perceptual life-worlds and understand how perceptions lead to actions - a cycle which he entitled Funktionskreis or "functional circle".

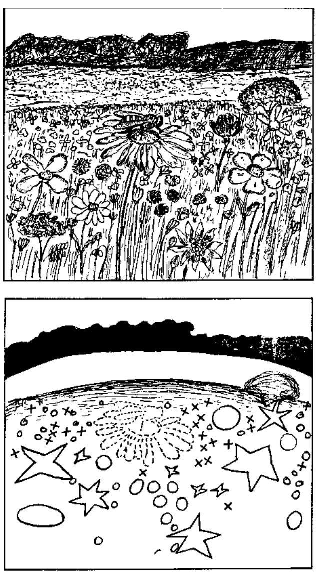


Fig. 1.5. Comparative diagram of human perception (top) of a field of flowers to a bee's perception of the same field (bottom).

> The desire to replenish, to do something to continue or fortify the systems we call living, is linked to their circular state […] *Funktionskreis* […] Because the living being is not a finished state but a continuous process that must replenish and keep integrated its parts, and ultimately reproduce before they fall into disrepair, succumbing to the wear and tear formalized in the second law of thermodynamics[…] [10]

Perception is therefore a critical factor in the synurbization process since an animal's ability to identify the specific conditions required to feed, breed and succeed is fundamental to its ability to survive within the city. Uexküll outlines that the Funktionskreis process occurs between two worlds; the *Merkwelt* or the "perception world," which includes everything a subject perceives, and the *Wirkwelt* or the "effect world," which encompasses everything a species produces. Together the two worlds construct a closed unit called a species' environment or its *umwelt*. Agamben reinforces the idea, stating that the environment is constructed of "a broad series of elements "carriers of significance" or "marks" which are the only elements of interest to the organism."[1212] "Every subject spins out, like the spider's threads, its relations to certain qualities of things and weaves them into a solid web which carries its existence."[13] Uexküll's position places each species as the center of its own being, giving it agency as an independent actor in its own environment.

This thesis contemplates the animal umwelt in order to reframe the urban environment as a novel ecosystem of non-human potential. The research and design speculations strive to overcome the nature-city dichotomy by engaging in a multiplicity of perspectives to establish productive hybrid conditions. The patterns and behaviours of human development are analyzed and restructured to support a diversity of human and non-human life-worlds. Within the synurbanized environment new human animal relationships can emerge with potential to encourage productive forms of cohabitation.

essay two

DEFINING LIMITS

Interspecies Relationships

Human engagement with synanthropic species is informed by spatial, cultural, and ecological factors that establish dynamic, often tenuous interspecies relationships. The thesis framework begins to unpack these complexities to define the limits between human and animal.

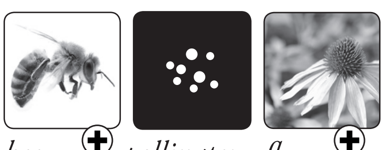
There are two fundamental elements to interspecies relationships; *biological interactions* and shared *spatial conditions*. *Biological interactions* define direct connections between human behaviour and the behaviour of a particular non-human species. Typically, these interactions include systems of waste production, food consumption, and disease transmission. The types of relationships are dynamic and range across the spectrum outlined in Figure 1.6, the *Biological Interaction Gradient*. They range from mutualism, (in which both species benefit), to commensalism, (where one species benefits from another who is not positively or negatively impacted), to parasitism, (where one species benefits from another who is negatively impacted). All of these interactions occur within a common physical space. The second element are the *spatial condition*s which are the environmental elements shared between species that comprise the space of cohabitation. An individual animal will have a desired territory that defines the allowable proximities and spatial overlaps between humans and non-humans. Often two different species' territories are at odds, for example a raccoon is quite comfortable living in an attic, above the heads of homeowners, while a human will find that level of proximity intolerable and invasive. Together the *biological interactions* and *spatial conditions* outline the relationships between humans and animals.

The space of interaction is further delineated by *physical* and *conceptual limits*. *Physical limits* are constructed delineations around a space such as a building envelope of a home, a fence surrounding a conservation area, or a cage around an animal. Animals also construct physical limits which they use to define inhabitable space such as a bird's nest, an underground fox den, or a rabbit hole. *Conceptual limits*, from the human perspective, apply a perceived value to a physical space, defining it to varying degrees as *for human* and/

high productivity

MUTUALISM

Relationship which benefits both partners, a form of symbiosis between two different species, a "biological barter"



COMMENSALISM

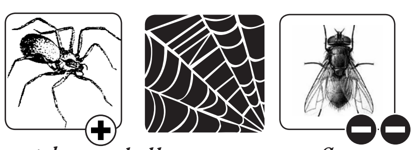
One organism benefits from a given relationship without affecting harm on the other, implies a neutrality in the supporting organism however a slightly parasitic affect is often discovered

PARASITISM

Non-mutual relationship in which the parasite benefits at the expense of the host inflicting minor harm by reducing the biological fitness, "one eats at the table of another"

ANTAGONISM

One organism benefits at the expense of another typically inflicting substantial harm enough to terminate the life of the other organism; includes predation, the consumption and absorption of a prey's tissue



spider *kills+consumes* *fly*

AMENSALISM

An imbalanced and unproductive relationship where one organism affects harm onto another without independent gain

human *cutting* *grass*

COMPETITION

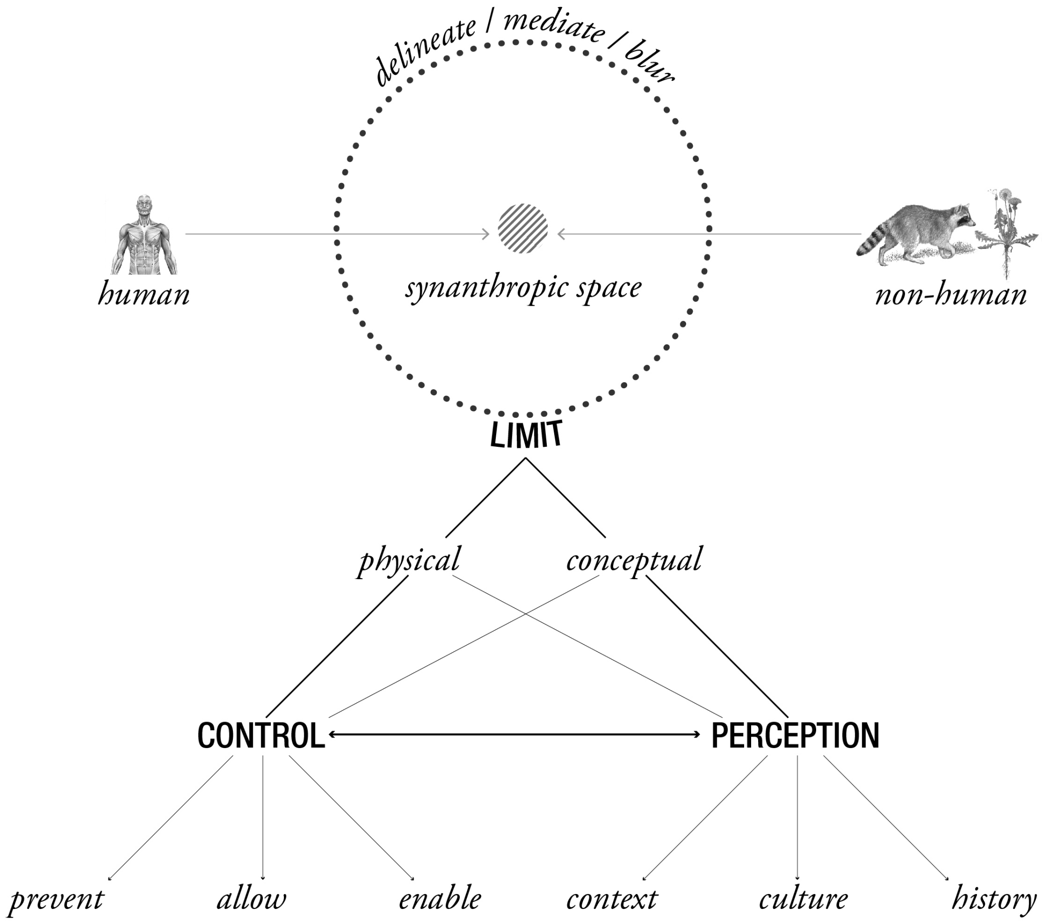
A mutually detrimental relationship initiated by limits in shared resources which affects both organisms, results in decline of fitness in the weaker organism due to dominance by the stronger

rabbit *resource* *human*

low productivity

BIOLOGICAL INTERACTIONS

Fig. 1.6. Between individual species.



STRUCTURE OF PHYSICAL & CONCEPTUAL LIMITS

Fig. 1.7.

or *for animal.* However an animal perceives the same space differently and applies an alternate conceptual value as defined through Uexküll's ideas of the *umwelt.* The dynamics between the physical and conceptual limits highlight spaces of contention which become possible sites for design intervention.

Relationships between physical and conceptual limits can be categorized into three types. *Coplanar limits* occur when both physical and conceptual limits align along the same boundary, for example, a spiders web is a physical structure which denotes its conceptually defended territory. *Overlapping limits* occur when a human constructed limit intersects with a species conceptual limit, for example, when the fence defining a conservation area intersects the conceptual homerange of an animal such as a migratory bird. An *isolated limit* occurs when a conceptual limit exists but does not have a physical barrier to differentiate it, for example, a magpie defends a conceptual territory which does not have a physical boundary that defines it.

Informing human levels of limitation are the elements of *control* and *perception*. *Control* is the imposition of gradients of authority over another to maintain a desired status. Each act and physical manifestation of control can prevent, allow, or even enable the *other*, structuring specific relationships between human and non-human. This is evident in historical attempts to control ecology; take for example the conversion of wolves from competitors to collaborative hunting aids during the Ice Age which signified the first domestication and control of a species by humans. Traditional agrarian societies controlled pastoral animals through the physical barrier of the fence to define their grazing and migration patterns. Within contemporary society, humans are taking control against invasive species such as Asian carp and zebra mussels in order to maintain a desired ecological condition within conceptually defined territories. Throughout history humanity has aspired to maintain dominance and control its biological interactions with animality.

Perception is defined as a mental impression which informs how something is regarded, understood, or interpreted and is widely influenced by history, context, culture, and politics. The general perception of nature has evolved through history. In hunter-gatherer societies, nature was perceived as a utilitarian source of food but also was held in spiritual reverence. Late agrarian societies looked at wilderness as a place of evil and peril.[1] Contemporary perceptions of nature vary from the consideration of ecology as a resource to be exploited for human benefit, to a valuing of the environment for its own sake. The perception of certain species fluctuates along these lines and is often tied to their appearance, behaviours, abundance, productive value, and environmental impact. Animals that are aesthetically pleasing but pose a threat, such as a grizzly bear or a cougar, are held in reverence. Meanwhile species who are found to be grotesque but may hold productive value as an ecological service or food resource, such as bats and vultures, are widely dismissed. The diverse socio-economic and cultural factors which impact perception vary dramatically, making the conceptual limits of synanthropic space more ambiguous but also malleable.

The two factors of control and perception are intrinsically tied and mutually inflect each other. A human's perception of a species informs the degree to which they aspire to control it. Simultaneously the level of control of the *other* effects human tolerance and allowable proximities to it. Take the *Human Animal Interaction* diagram in Figure 1.8 for example. The bird feeding in the backyard, separated from the human by the physical boundary of a wall and window, is considered a source of entertainment. If the same bird penetrates the controlled boundary of the building enclosure, it is suddenly perceived as an unwelcome pest. Only non-human species who are civilized, contained and controlled are allowed to occupy the domestic realm. It is a question of tolerance and control therefore, once the bird is contained within a cage, it becomes a beloved pet. If one of the factors of *control* and *perception* changes, the other is influenced and as a result the physical and conceptual limits are then shifted, extended or augmented. What if the bird remains at the periphery of the house, outside the conceptual domestic territory of the human but inhabits the eaves trough, therefore embedding itself into the physical boundary of the home? Could new interspecies dynamics emerge when the physical and conceptual limits intersect but do not overlap? Synanthropic limits are complex, relational and subjective boundaries which vary through time, circumstance and individuals involved. What is tolerable for one individual is unacceptable for another. Therefore the ultimate question is, *how close is too close?*

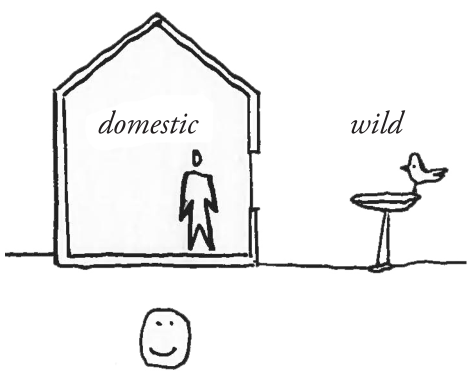
The design of *physical limits* can alter the dynamics of human control over animals. Once *control* is redefined, human *perception* is augmented. For example once the bird is controlled within the *physical limit* of the cage, the human *perception* shifts from considering it an intruder towards accepting it as a welcome cohabitant. Therefore, engaging the factors of *control* and *perception* in the design of *physical limits* and interfaces between humans and non-humans can deliberately establish synanthropic relationships.

Expanding Limits

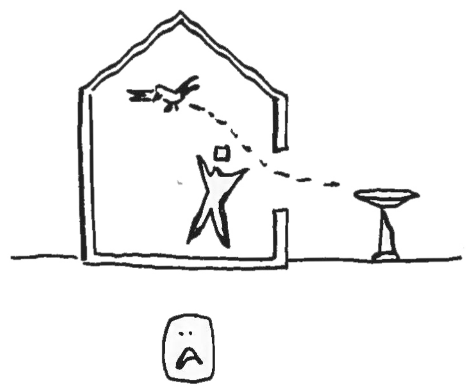
The potential of synanthropic design exists in the thickening and multiplication of the physical interfaces between human and animal to create an urban environment which is intentionally inclusive. Jacques Derrida writes in *The Animal That Therefore I am*, that "[e]verything I'll say will consist, certainly not to efface the limit, but in multiplying its figures, in complicating, thickening, delinearizing, folding, and dividing the line precisely by making it increase and multiple."[2] He redefines the limit between human animal as space of intensification, where a multiplicity of hybridizations could occur. Embracing that logic, building systems could create inhabitable space within and outside the environmental enclosures along allowable limits.

Infrastructures could establish productive frameworks in which species perform ecosystem services such as pest control, waste management, food production and even develop alternative systems of animal employment. In turn, such operative frameworks would ask humans to engage with and even encourage cohabitation with synanthropic species. Physical interfaces could give animals agency, enabling them to act in and alter the urban environment. Giving definition to synanthropic space could establish cultural value for the animals who cohabitate within them, embedding species into human society as companion species and carriers of collective identity. The design of physical limits could begin to fulfill Jennifer Wolch's call "to re-imagine the anima-urbis–the breath, life, soul, and spirit of the city–as being embodied in its animal life."[3] Cultural structures and ecological systems of both human and animals would therefore become entangled, no longer at odds with one another.

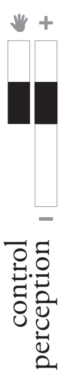
Synanthropic architecture could change the perception of urban cohabitation. It could invite new species to adapt to the city, supporting them through the synurbization process. In the future, everyone, both human and non-human, will have a right to become citizens of the city.



neighbour

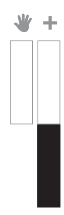


intruder



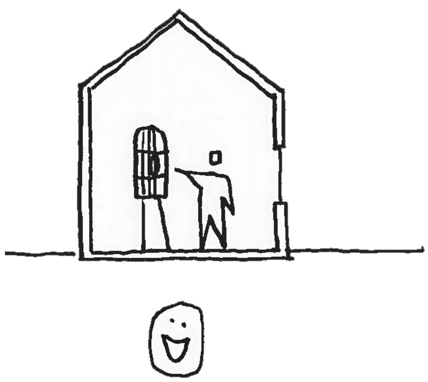
From within the house, the bird is a visually appealing presence. It is *perceived* as a friendly neighbour, even admired as a form of "wild" in the city.

The building envelope is an architectural boundary that divides interior from exterior and provides the human occupant with *control* of its domestic environment.



Opening the window blurs the physical limit between insde and out. *Control* is relinquished and the bird is now capable of entering the domestic realm.

Human *perception* deems the presence of the bird within the house as undesirable. It is disruptive, *uncontrolled* and a threat to the conditions of domesticity.



pet

synanthrope

A cage is used to contain and *control* the actions of the bird. The relationship between human and animal is restructured within the house.

The *perception* of the bird is that it is a pet, treated with respect and kept within the house for entertainment and companionship.

Cohabitation between human and animal occurs in the thickness of the building envelope. The physical limit of the house provides habitat for the bird and blurs the degree of *control* the human has over the bird.

The conceptual limits of human and animal territory are poorly defined. For some humans this may be tolerable, for others it could be considered perverse.

HUMAN ANIMAL INTERACTIONS

Fig. 1.8.

Illustrates the dynamic relationship between the factors of control and perception which define human interactions with animals.

essay three

AGENCY IN THE URBAN BIOME

From Paradox to Synthesis

At the turn of the 19th century, North American cities developed into dirty and congested spaces of industrial production. The image of the city was filled with smoke stacks, dirty streets and congested air which stood in stark contrast to the cultural depictions of nature as a picturesque landscape. This process helped solidify the cultural conception of the city as the antithesis of nature. Since then, urbanization has continued to be perceived as the conversion of ideal natures into the artificial built environment. In 1979, Bookchin wrote, "[t]he modern city represents a regressive encroachment of the synthetic on the nature, of the inorganic (concrete, metals and glass) on the organic, or crude elemental stimuli on variegated wide-ranging ones."[1] The city was still widely perceived as a degraded form of the complexity of the natural world.

A societal shift was apparent in the 1980's in which humanity's relationship to nature was reassessed. Eugene F. Soermer and, atmospheric chemist Paul Crutzen defined the Anthropocene, a theory which embeds human history within natural history at a geological time scale and conflates human and natural systems. Simultaneously post humanism began to question the city / nature and human / non-human dichotomies present in humanism and instead conceived of them not as opposites but as synthesis of complex systems. Posthumanism writer, Francisco González de Canales, writes that, "For a long time the main task of the human collective was to distinguish itself from other realities. To become human was to separate from the animal nature of man, thus to differentiate human from nature… Humanity has to let humanism go. It is time for the reconciliation between [hu]man and animals, human and nature."[2]

Within contemporary society, the idea of nature is evolving and beginning to reconfigure the way humans consider, act, and design within the shared environment. In order to integrate ecological considerations into the development of cities, urbanization must be reconceptualised as an ongoing process of transformation through which novel natures are constructed.

Lefebvre's concept of "second nature" supports that idea, positing that the city is a socially produced environment informed by a complex system of political, economic and social processes. Lefebvre initiates a dialogue about how humans can shape and reshape the urban landscape by embedding human process into the production of environments. The objectives of Urban Political Ecology further the argument that urbanization is a process of socio-ecological change informed and inflected by both social and ecological conditions. "[N]atural or ecological conditions and processes do not operate separately from social processes, and that the actually existing socionatural conditions are always the result of intricate transformations of pre-existing configurations that are themselves inherently natural and social." The emerging field of Ecological Urbanism, critiques Landscape Urbanism and other ideological practices. It reiterates the principles of Urban Political Ecology and calls for the creation of sensitive and inclusive environments through socio-ecological thinking and a systems-based design practice.

The intersection of Lefebvre's "second nature," Urban Political Ecology and Ecological Urbanism argues that ecological and sociological factors define the formation of the urban environment and must be considered in the design of future cities. Therefore a new definition for the "city" is required in order to reconceptualise it as the manifestation of complex socio-ecological relationships.

Redefining the City as a Biome

A biome is defined as a naturally occurring community of flora and fauna who occupy a habitat. The term anthrome has emerged more recently to define conditions in which direct human interactions with an ecosystem have created human-altered states. However, humans are not the only species who are capable of modifying landscapes. Take for example invasive plant species which colonize the edges of water systems and overtime alter the sedimentation rate thereby changing the form and movement of streams; or insects such as leaf cutter ants who modify terrain to create burrows like the 500 sqft colony found underground in Brazil. Mammals can also have direct impact on the environment, for example, herds of herbivores such as deer will trample vegetation along riverbeds which accelerates erosion. Differentiating landscape transformations caused by humans from those created by animals perpetuates the division between them. Therefore the pejorative use of the term anthrome must be discarded in favour of a language which depicts the city as an alternate form of nature, an urban biome.

Urban and suburban biomes are an assemblage of *novel ecosystems* which differ in composition, structure and function from past systems and cannot be reversed to their previous state.[3] Occasionally novel biotic species who enter into new ecosystems evolve to support species native to the area. As a result, the invading animal becomes integral to the functioning of the ecosystem. Overtime these shifts in form and function of an ecosystem begin to have resonating and lasting effects, until another naturally occurring or human initiated disturbance catalyzes another landscape evolution. Landscape transformation is a certain reality. The physical form and overall function of a landscape is constantly evolving at varying time scales and magnitudes due to both human and non-human influences.[4] Defining the city as an assemblage of novel ecosystems does not try to justify the massive scale and rapid pace of landscape transformation enacted by human populations but attempts to situate humans within ecological processes instead of at odds with them.

This thesis aligns with the biological principles of novel ecosystems and Lefebvre's sociological theories of "second natures" to define the city as a new form of ecology. The term *urban biome* therefore describes the city as an ecosystem produced by entangled socio-ecological conditions. Within it, all flora and fauna are equal city dwellers, capable of acting within the environment. Abiotic physical limits are therefore also susceptible and influential to the same dynamic interrelations as the biotic subjects and must engage in the dynamic systems of the city. The urban biome is therefore defined, not as a form of anthropogenic destruction but, as a field of shared collaboration, construction, and evolution in which architects have agency as the makers of human habitats. The question of species cohabitation provides a more specific framework in which to unpack the complex social, political and economic networks between human and non-human species. By dissecting how human socio-environmental processes enable, inflect or inhibit the synurbization of species, the thesis aspires to engage ecological influences in the design of prosthetics which create mutually productive synanthropic environments.

Synanthropic Architecture

Within the urban biome, architecture has the ability to define and structure synanthropic space and in doing so, support the development of robust novel ecosystems. The posthuman position "challenges the long-standing conception of the building as an object autonomous from its environment and governed by disciplinary interiority," and from this critique, new forms of architecture can emerge.[5] Therefore, synathropic architecture must engage ecological systems in order to define productive interactions, enable cohabitation and ultimately, positively effect the urban ecosystem.

In 1969, Ian McHarg began to engage the questions of ecological urban design through his book, *Design with Nature*, which applied ecological principles to the design of human-built space. Through his work, ecosystems were understood as flexible networks formed by external environmental stimuli merged with internal cultural stimuli. Paolo Soleri explored similar questions and established the concept of an Arcology, an inhabitable, self-sustaining infrastructure which minimizes human impact on the environment. In 1970 he applied his principles of architectural ecology to the construction of Arcosaniti, an experimental town in the desert landscape of Arizona. The objective was to generate a large scale architectural solution which combined the urban benefits of interaction and accessibility with environmental practices such as minimum resource consumption and increased interaction with nature. The emerging practice of Reconciliation Ecology was established by Micahel Rosenzweig and holds the same objectives of reducing environmental impact and engaging ecological principles through design. It attempts to positively leverage anthropogenic transformations as a means to design and invent new ecosystems which reconcile conditions between humans and animals. It argues that humans must allow species to cohabitate in the places they work, live, and play in order to sustain biodiversity. The practice is being applied to multiple scales from large scale agroforestry where crops such as coffee or fruit trees are cultivated beneath a canopy of native shade trees, to small scale interventions such as Daniel Metcalfe's Urchin Tile which integrates habitat for marine species into artificial structures used in an intertidal zone, rendering it accessible to humans and non-humans. Reconciliation Ecology expands ecological design consideration beyond environmental systems and native vegetation and begins to emphasize the value of integrating specific animal species.

Fig. 1.9. Urchin Tile designed by Daniel Metcalfe for an outfall pipe in Hannafore beach.

Geoff Manaugh, author of BLDG BLOG, speculates on architecture's ability to generate new ecosystesm in an article entitled *Architectural Ecologies.*[6] He writes about the possible existence of a historical architecture style whose ornamentation provides the ideal nesting space for a specific type of bird. The bird, who maintains a particular seed-based diet, would inadvertently disperse plant seeds around the base of the building, seeding a new landscape on the site. Manaugh imagines an architectural language that inadvertently initiates the cultivation of a new ecology.

The thesis draws inspiration from Manaugh's speculations to develop ideas for a *synanthropic architecture* that would deliberately cultivate novel ecosystems which support non-human species through architectural design. In order to accomplish this, it must address the cultural and biological relationships between specific animal species and their human counterparts. Therefore synanthropic architecture also has a responsibility to act ethically towards the non-human. According to Haraway, to act respectfully towards species is "[t]o hold in regard, to respond, to look back reciprocally, to notice, to pay attention to have courteous regard for, to esteem: all of that is tied to polite greeting, to constituting the polis, where and when species meet."[7] Ethical animal design necessitates extensive consideration of a species' breeding, habitat, territory, and feeding parameters, as well as an understanding of its seasonal and life cycles in order to avoid creating ecological traps and provide truly viable novel ecosystems. It must also acknowledge that despite human efforts to support a particular species, animals are independent subjects who have the freedom to act on their own accord. Efforts made in encouragement of one species may actually be capitalized on by another. Regardless of the outcome, diverse forms of animal inhabitation of human dominated spaces can be considered a success.

Synanthropic architecture therefore strives to deliberately generate new ecologies through an architectural language which incorporates animal subjectivity into design considerations. The objective is to encourage human animal cohabitation and establish mutually productive systems which contribute to the densification and diversification of the urban biome.

part two

URBAN BESTIARY

Fig. 2.1. Bestiary Subjects.

A COMPENDIUM OF SYNANTHROPIC BEASTS

A *bestiary* is a text, typically created in the medieval era, which assembles religious, mythological, and scientific information to depict the animal world as it was known. The document contained narratives and imagery of real and fictional non-human species and served as an allegorical tool for different religious groups. The representations merged cultural perceptions with what limited scientific knowledge was available at that time. These books of beasts incorporated an animal's symbolic value, biological behaviors, and relationship to humans, to create a holistic portrait of the animal.

Since then, significant advancements in the field of science have shifted humanity's understanding of the earth's non-human species. Animals are no longer widely used as allegorical tools except for in children's literature and media. Instead, human methods of observing animals have moved towards quantitative, analytical and procedural models. Wild animals are tagged and monitored for research purposes; past and present species are studied for their biological attributes and species populations are quantified and documented to take accounts of which of the world's species are at risk of extinction.

The thesis research revisits the model of the medieval bestiary and observes the animals as both cultural symbol and biological subject. The objective is to establish a holistic portrait of the synanthropic species which inhabit the urban biome alongside humans. In order to do so, the thesis recognizes that there are two definitions of the term *observation.* The first defines an observation as the act or process of observing to gain information. Scientific practice relies on this objective method. The second definition describes it as a remark, statement or comment based on something one has seen heard, or noticed. Through this perspective, an observation is a subjective perception by an individual, conveyed to another. It is a cultural exchange between people. Together the definitions suggest that there is a subtle duality to the term *observation* as both a scientific tool and a cultural act. It is with this bifocal lens that the thesis investigates the animal subject within the suburban and urban biome.

Urban Bestiary: A Compendium of Synanthropic Beasts compiles observations about evolving human perceptions with biological facts about an animal's habitat, behaviours, and environment. A series of illustrations, narratives, and diagrams, each contemplate the animal through a different lens. The tone of the writing deliberately varies from scientific fact to subjective narrative in order to explore a diversity of perspectives. Each animal is introduced through a fictional narrative illustrating a typical interaction between the species and its human counterpart. A timeline and cultural iconography are used to trace the evolution of the human relationship and perception of the species through history. Biological diagrams outline the different type of relationships each animal engages with other species. Sensory maps and umwelt drawings attempt to unpack the perceptual world of the animal. Habitat inventories catalogue the physical space of interactions between the species and the built environment. The *Urban Bestiary* is therefore able to examine the selected synanthropic animals through multiple lenses to gain an understanding of the historical, political, biological and cultural identity of the non-human species.

Five urban-dwelling animals are explored; each are exemplary synanthropic species who have successfully adapted to the city. The objective is to unpack the synurbization process and understand, *who is the synanthrope?* The *House Sparrow* is a deliberately introduced species, brought into cities by settlers seeking the fauna of their motherland. Overtime, with human assistance, the small birds have established thriving populations which often outcompete native species, a rising concern in contemporary society. The *Brown Rat* however, has been unintentionally dispersed across the entire globe due to human migration and colonization. The species' survival is intertwined with humans, mirroring the patterns of settlement and consumption, and as a result, is the most despised and least tolerated synanthrope. The *Feral Pigeon* exemplifies the relinquishing of human control to allow a domesticated species to evolve into feral animal. Within the city, the pigeon is a polarizing species; it is simultaneously a symbol of public space, present in every park and plaza, but also a nuisance, damaging buildings where they perch and nest. The *Raccoon* represents native species who have successfully adapted to human invasion and transformation of their habitat. Their curious actions, adorable character, and shear pervasiveness means that, despite their annoying behaviour, cohabitation alongside humans is widely tolerated. The *Peregrine Falcon* is a recently synurbized species whose successful adaptation has been deliberately supported by humans. The evolution of this predatory bird establishes a precedent for introducing new species into the urban environment.

The exploration of each of the five animals expands understanding of the human-animal relationship to establish a tool set for future synurbization. It interrogates contemporary relationships with animals to identify opportunities to restructure the limits between humans and non-humans in the urban biome.

URBAN BESTIARY

a compendium of synanthropic beasts

HOUSE SPARROW

Passer domesticus

Peer out from the kitchen window to the backyard beyond. There, perched on the feeder is a brilliantly coloured cardinal, dining majestically. Suddenly, she is abruptly disturbed by an onslaught of house sparrows, eager for an easy meal. These opportunistic eaters dine on everything from seeds and insects to forgotten crumbs. A synanthrope to the core, the sparrow thrives in its proximity to humans inhabiting our homes, feeding on our discarded crumbs. Before the wary homeowner can defend their domestic fortress, the sparrow and his social clan have made themselves at home, roosting in crevices, attics and vents. Each dawn and dusk the new inhabitants pronounce their presence singing out for all neighbours to hear.

The domestic sparrow is free to thrive and proliferate in the city, its only enemies are the ferocious domestic cat, the stealthy hawk, and the agitated owner of a BB gun. Passer domesticus was first introduced from England to eliminate tree and crop insect pests and has become a pest itself spreading across North America thanks to an abundance of grain and architectural habitats. Both pest and pet, aphrodisiac delight and vulgar commonality, the domestic sparrow is forever present in the science and culture of our urban environment.[1]

The house sparrow is a creature so common that it has garnered a plebeian reputation and is often overlooked in the urban biome. This could result from the fact that it has been in the company of humans for hundreds of years as both a spiritual symbol and an urban nuisance. Ancient Egyptian hieroglyphs used sparrows to convey either "small, narrow, bad" or alternatively "a prolific man" and "revolution of the year." In Ancient Rome, the sparrow was associated with lust and subsequently with the Roman goddess Venus. The Roman poet Catullus cherishes the sparrow and writes, "My mistress's sparrow is dead, my mistress's pet which she loved more than her very eyes."[2] His poem motivated contemporary poets to take up the sparrow as a subject. In 15th century literature, Passar domesticus was further lauded by Shakespeare who wrote, "there's a special providence in the fall of a sparrow."[3]

Beginning in the mid 16th century, the sparrow transitioned from spiritual symbol to a consumable resource. Earthenware pots hung from eaves to attract nesting birds and the young were harvested for food. Elizabeth Raffald's widely popular book, *The Experienced English Housekeeper* was first released in 1769 and featured a recipe for sparrow dumplings. The consumption of this common bird continued into the 19th century. At that time, the presence of sparrows was ubiquitous and Londoner's fostered an admiration for the sober handsomeness of the common house sparrow. Its modest colouring and ordinary qualities evoked the persona of the average urbanite as a "person who puts on worn but respectable garb - and if you make allowance for city discoloration, the sparrow is truly handsome."[4]

In 1851, the perception of the house sparrow shifted with the construction of the Crystal Palace for the Great Exhibition. Sparrows gleefully inhabited the plate-glass and cast-iron structure becoming a nuisance for visitors. To remedy the problem, sparrow-hawks were employed to prey upon them. The house sparrow was becoming a pest.

I imagine no Yankee would wish now to be without the life and animation of the house sparrow in his great cities. They are like gaslight in a town a sign of progress. I admit the bird is a little blackguard — fond of low society and full of fight, stealing and love-making — but he is death on insects, fond of citizen life, and in every way suited to be an inhabitant of the New World.[5]

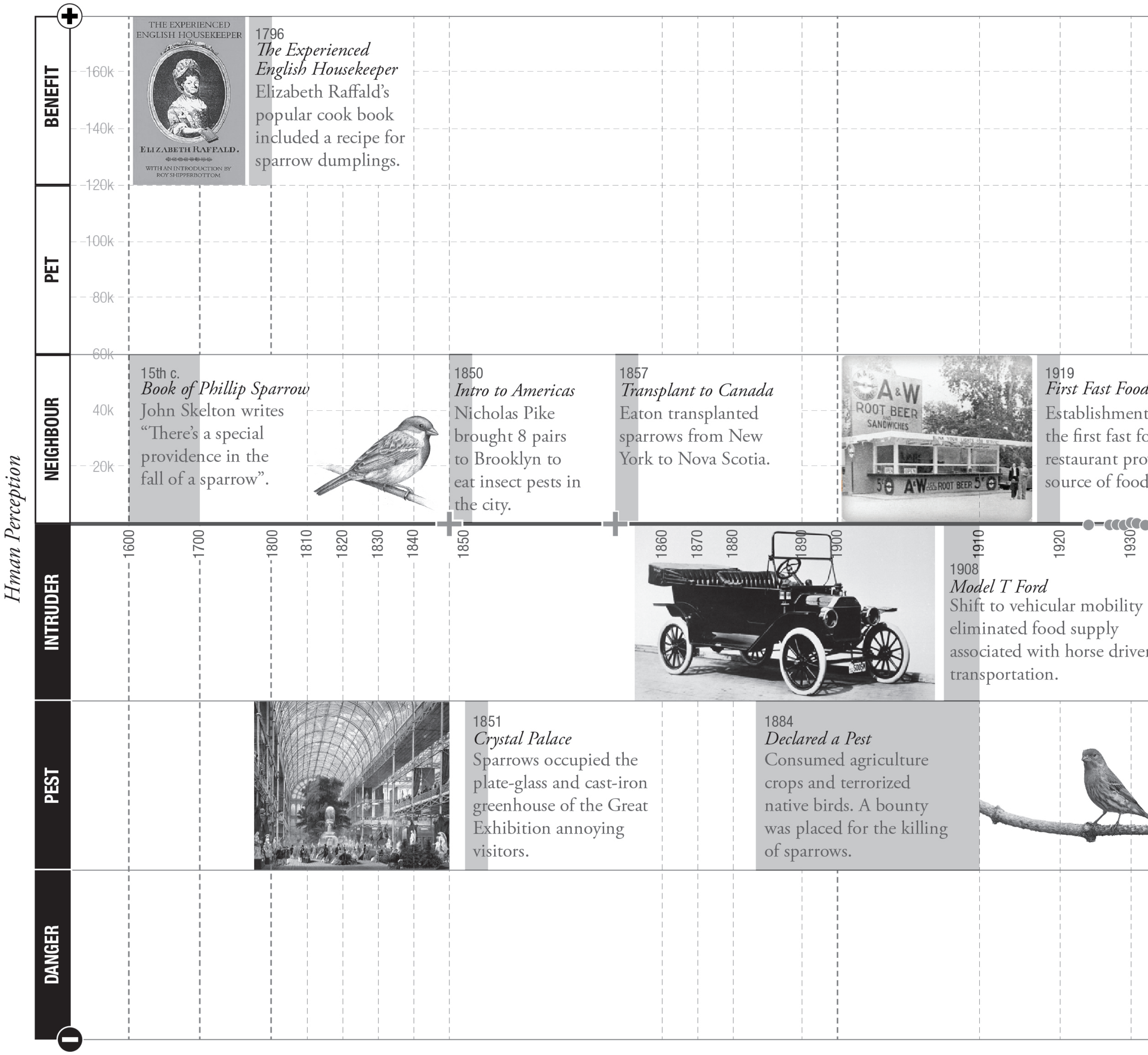
We can't defeat a foe like this
With gunshot or with bows and arrows;
We must resort to artiface
To cope with enemies like sparrows.[6]

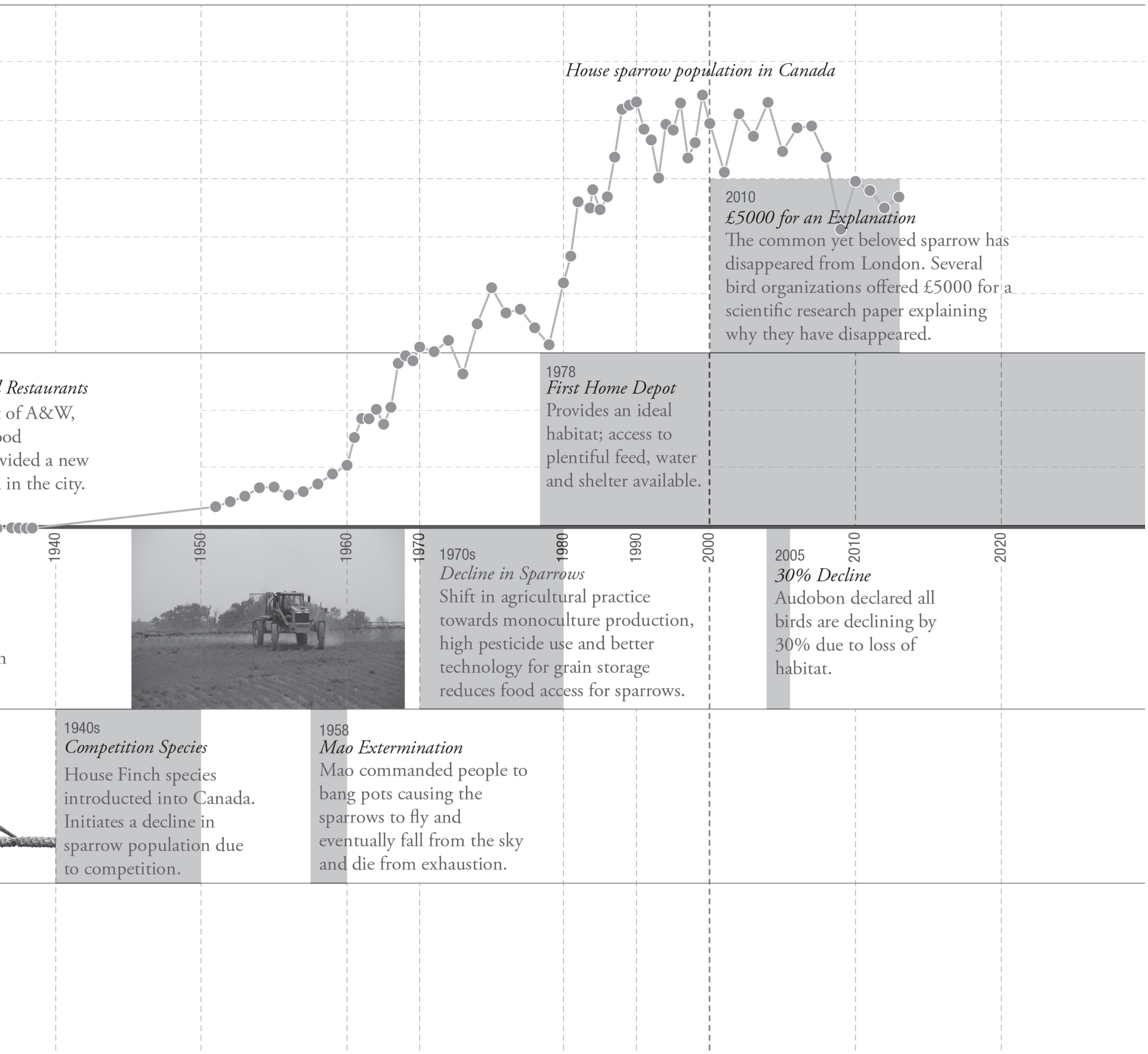
Fig. 2.2. English city of Sparrows.

Fig. 2.3. Earthenware pots for shelter House sparrows.

Timeline of Human Perception of the House Sparrow

Fig. 2.4.




House sparrow population in Canada
2010
£5000 for an Explanation
The common yet beloved sparrow has disappeared from London. Several bird organizations offered £5000 for a scientific research paper explaining why they have disappeared.
Restaurants
of A&W,
ood
vided a new
in the city.
1978
First Home Depot
Provides an ideal habitat; access to plentiful feed, water and shelter available.
1940
1950
1960
1970
1980
1990
2000
2010
2020
1970s
Decline in Sparrows
Shift in agricultural practice towards monoculture production, high pesticide use and better technology for grain storage reduces food access for sparrows.
2005
30% Decline
Audobon declared all birds are declining by 30% due to loss of habitat.
1940s
Competition Species
House Finch species introducted into Canada. Initiates a decline in sparrow population due to competition.
1958
Mao Extermination
Mao commanded people to bang pots causing the sparrows to fly and eventually fall from the sky and die from exhaustion.

Biological Interactions of the House Sparrow

Fig. 2.5.

For the common house sparrow, the city is a playground of expansive rooftops, electrical wires and window ledges. With minimal predatory threats, passer domesticus is free to frolic through the urban biome without care. House sparrows, ever the optimist, will often commandeer the nesting homes of native birds, much to the despair of conservationists. But what is a bit of friendly competition between species? Isn't that what Darwin always said?

House sparrows are the city's messengers, transporting seeds and diseases from location to location, species to species. A flowers seeds are consumed by the hungry bird, carried by flight, then transplanted through digestive disposal into a new ecosystem. Additionally sparrows are reservoir hosts, containing and transmitting West Nile Virus and other human and mammal afflicting diseases. Depending on who or what you ask, passer domesticus is either the productive or the antagonistic socialite of the city.

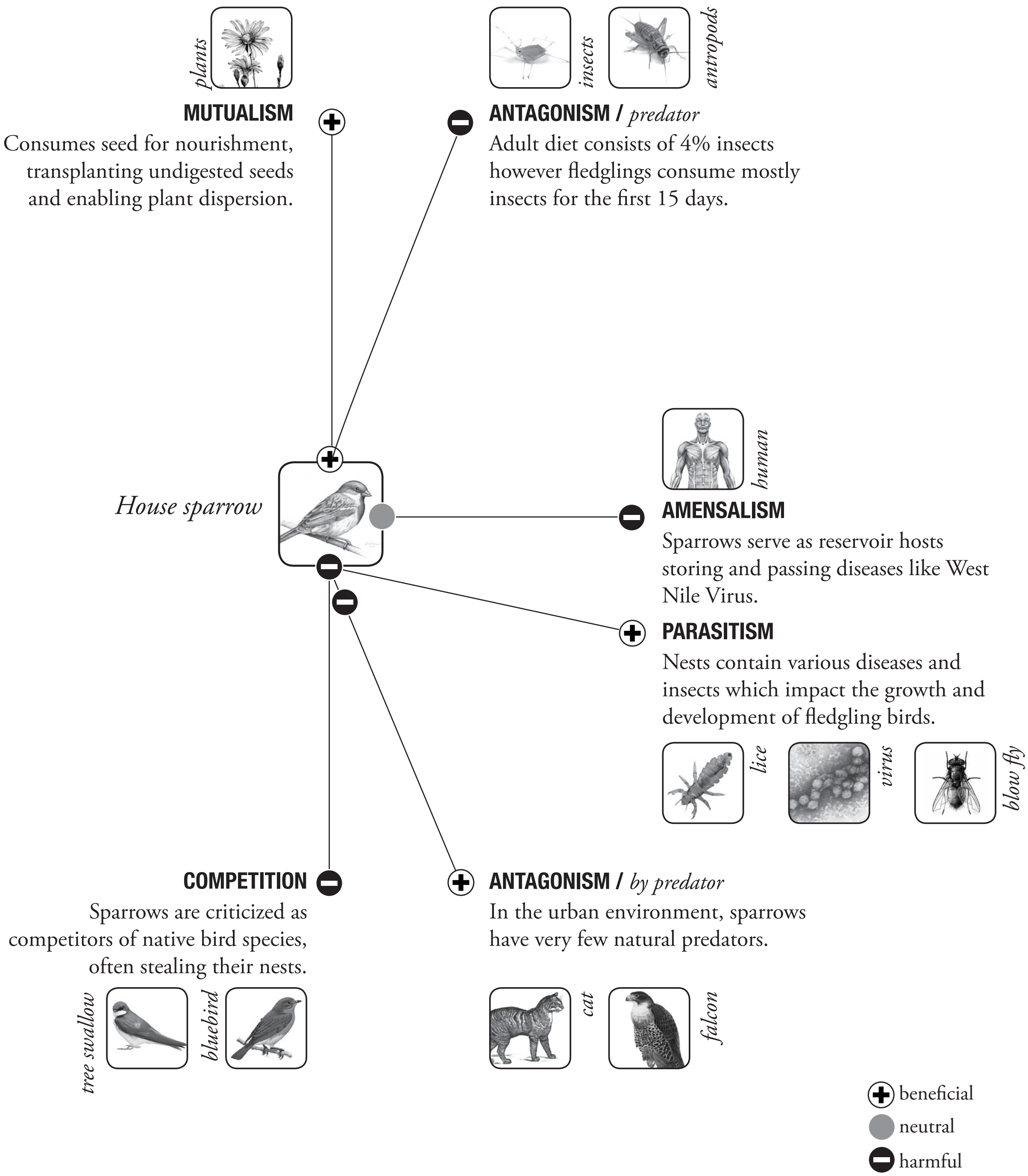

plants
MUTUALISM
Consumes seed for nourishment, transplanting undigested seeds and enabling plant dispersion.
insects
antropods
ANTAGONISM / predator
Adult diet consists of 4% insects however fledglings consume mostly insects for the first 15 days.
House sparrow
human
AMENSALISM
Sparrows serve as reservoir hosts storing and passing diseases like West Nile Virus.
PARASITISM
Nests contain various diseases and insects which impact the growth and development of fledgling birds.
lice
virus
blow fly
COMPETITION
Sparrows are criticized as competitors of native bird species, often stealing their nests.
tree swallow
bluebird
ANTAGONISM / by predator
In the urban environment, sparrows have very few natural predators.
cat
falcon
beneficial
neutral
harmful

Fig. 2.6. Remaining masonry party wall inhabited by sparrows.

The waters of the Grand River inundated the ground floor during the flood of 1974, damaging the neighbourhood shop beyond repair. The business never recovered and eventually the building was abandonned. Over time it fell into even greater disrepair and was demolished leaving the adjacent building's party wall exposed to stand in solitude next to the ever powerful Grand River.

It may be an elaborate story but no matter the fate of the building that once stood at the foot of the Main Street bridge, it has left its mark. Rectangular recesses in the remaining stone masonry wall once supported the wood floor beams of the, since demolished, building. At some point a house sparrow, the great synanthropic opportunist, capitalized on the presence of the cavites, building nests within the wall's protection. The following year, that same bird and his mate returned to that very nest cavity but this time, they brought their comrades. Together they to lay their eggs and hatched their fledglings, proliferating the species once more. Each year, the pattern continued.

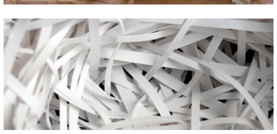
On a bright May morning, en route to procure a coffee from Grand Cafe, countless people traverse the phantom footprint of the forgotten building. From the stone masonry wall resounds a chorus of house sparrows, rejoicing the day. Twigs, dried leaves, paper and assorted scraps blanket the pavers below. The walkway is dotted by dead baby fledglings who met an unfortunate fate when they leaned too far out of the nest. Nevertheless the parents swoop from their shelters to a nearby tree collecting invertebrates to feed their young. From across the road, a patient falcon observes the frenetic affair from her perch atop Central Presbyterian Church. She too has young to feed.

STRUCTURE / *Nest*

House sparrows prefer domed shaped nests typically composed of three layers. The outer layer is typically built of twigs and roots, the inner structural layer is dead grass and leaves which is then lined by soft feathers and paper.

Materials

Not a choosy species, the house sparrow will fill the cavity with a wide assortment of found materials. Traditional building supplies include twigs, grasses and leaves but straw, paper, string and cloth are all useful too.

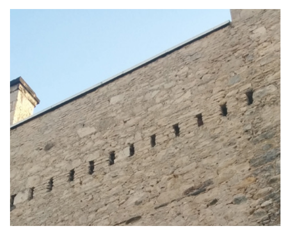


SITE / *Naturally occurring*

Prefer cavities, typically either pre-existing or obtained from other birds. On occasion they will excavate sand or rotten trees to create a sheltered area. When other options aren't available they will construct exposed nests on tree branches.

Human-built shelter

Sparrows will capitalize on the crevices, ledges and cavities that are a part of architectural detailing particularly in exposed structure or at junctures where one material or surface meets another.



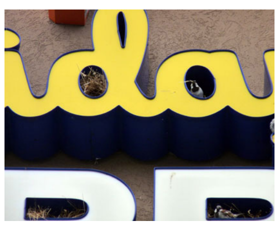
Urban elements

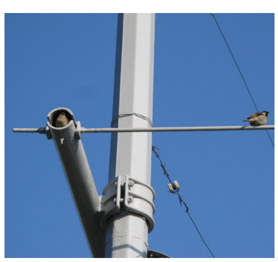
Street lights and neon signs provide protected sites beyond the reach of human predators. During the colder months, the heat generated by the lights enables birds to continue nesting.

Designed habitats

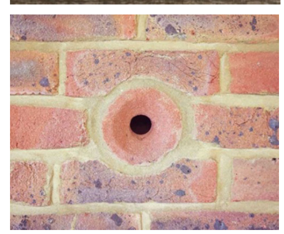
Nest boxes, bird houses and architecturally designed cavities are all deliberately constructed sites for nesting. They aestheticize and frame cohabitation as a desirable condition.










BROWN RAT

Rattus norvegicus

Night falls and everything is quiet. A faint scratching disturbs the peacefulness which blankets the house. The sounds of tiny scurrying feet is followed by the creeking of the pantry door which someone left askew. Within the shelves are heavy with boxes of crackers, packages of marshmellows, bags of rice, chips, dried fruit and nuts—enough food to feed a family, either Homo sapien or Rattus norvegicus. Whiffs of things salty, sweet and entirely delectable guide the rat's powerful nose to explore the pantry's prime selections. A clattering reverberates from the pantry as the ravenous rat blindly clamours onto the nutritional mountain, gnawing with sharp teeth into bags, boxes and anything humanly edible. On the otherside of the layers of drywall, accoustic insulation and wood studs, a child trembles in fear of the noises—there's a monster in the kitchen. The soft thump of a child's foot on the wood floor echoes in the sharply tuned ears of the rat. The sound of another footstep sends the rat scampering nimbly down the pantry shelves, skirting along the floor baseboards with only wiskers to guide it. Again the sound is heard, a human is coming. The rat moves hastily in the blurry darkness of tactile space towards a safe haven beneath the stove. Click—and the lights come on. Not a monster in sight in the quiet, domestic kitchen.

Where there are humans, there are rats. *Rattus norvegicus* has existed alongside humans throughout history, pervading our ancient mythology, traditional folklore and even popular culture. Its reputation is paradoxical, perceived as both vile and auspicious yet, intelligent and sacred, playing both antagonist and protagonist in the history of our culture.

Fig. 2.7. Raja Ravi Varma (1910)

Within Karni Mata Temple in India, the rat is a sacred creature. Ganesha, the elephant headed deity of Hinduism, was accompanied by his vahana who, beginning in the 7th century, took the form of a rat. The temple, constructed in the 17th century, is a space for the ancient Hindu practice of rat worship. The belief is that rats symbolize reincarnated people who are hiding from the wrath of Yama, the Hindu god of death. Rats are native to India and for the Hindu people are important religious symbols.[7]

The rat is the first symbol of the Chinese Zodiac and is known for its wit, intelligence, charm and loyalty. Named *Shu*, the rat is identified as industrious and prosperous, able to accrue and retain items of value. Within Chinese culture, the rat is employed as a representation of human characteristics.

Fig. 2.8. Nazumi Charm (19th c.)

Japanese tradition speaks of the rat, *nazumi*, as a symbol of prosperity due to its association with the god of luck, Daikoku.[8] Rat *netsuke* or miniature scultpures were venerated as symbols of luck within traditional Japanese culture. In addition, if rats were found to have consumed the New Years cakes, it was believed to indicate bountiful harvests for the year.[9]

For some South African tribes the hair of the rat is worn as a charm to guard against the enemy's spear.

Romans however viewed only the white rat as auspicious. Black rats bore unfortunate significance. Evidence of a rat's presence was enough to postpone business and halt personal activity.

Christian symbolism looks disdainfully upon the rat as a negative personality, a disesase within one's life. Due to its destructive behaviour to human health and environments, rats are perceived as symbols of evil, even associated with Satan. This is possibly why the rat rarely appears within Christian imagery.

What has become of the rat in modern culture? In our contemporary fast-paced society, we have little time to contemplate the symbolism and mythology of non-human species. So consumed by our own endeavours we are unconscious of the ubiquity of the rat within our society. We are caught in the 'rat race,' an endless self-defeating and pointless pursuit, a term which renders the futility of a rat wheel parallel to life in the city. We are the rat.

For graffiti artist Blek le Rat, the nocturnal rodent was the only wild creature living in his native Paris, leading him to boldly stating "Only rats will survive when the human race disappears and dies out." Beginning in 1981, Blek le Rat invaded Paris with thousands of stencil graffit rats.

Fig. 2.9. Blek le Rat (Paris, 1985)

Urban Rats

Rats are global colonizers, following the footsteps of humans. It is believed they crossed seas abreast ships, discovering new land as we expanded our trade routes. For humans, rats became carriers and spreaders of the Black Plague, a killer of thousands of Europeans. Now we fear and despise them despite their strong correlation to our expanding urbanization and uncannily similar dietary balance. Rats have become ubiquitous within the New York City subway system, defined as the enemy of the adorable Mickey Mouse and feared by any restauranteur. Their ability to climb and swim along with their poor eyesight has enabled them to proliferate through the subterranean sewer network. What saves them from dying of disease is their high sense of smell which enables them to identify minute levels of contaminants in food. Despite our often futile efforts, what actually keeps rat populations in check is predatory cannibalism.

Every home is at risk of invasion by the Norway rat who can gnaw through cinder blocks, lead sheeting, pipes and aluminum siding. A vertical pipe as small as 40mm diameter is a ladder for a rat and openings as smalls as 14mm become welcoming doors for these rodents.

Economically and biologically, rats are a problem in the urban environment due to their consumption and contamination of food, destruction of buildings and potential health risks. Is there any arguement to be made for their protection? The question is one of control, how do we fortify limits between human and rat co-habitants through physical constructions?

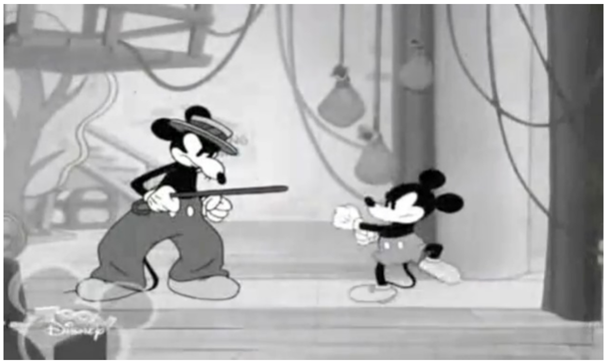
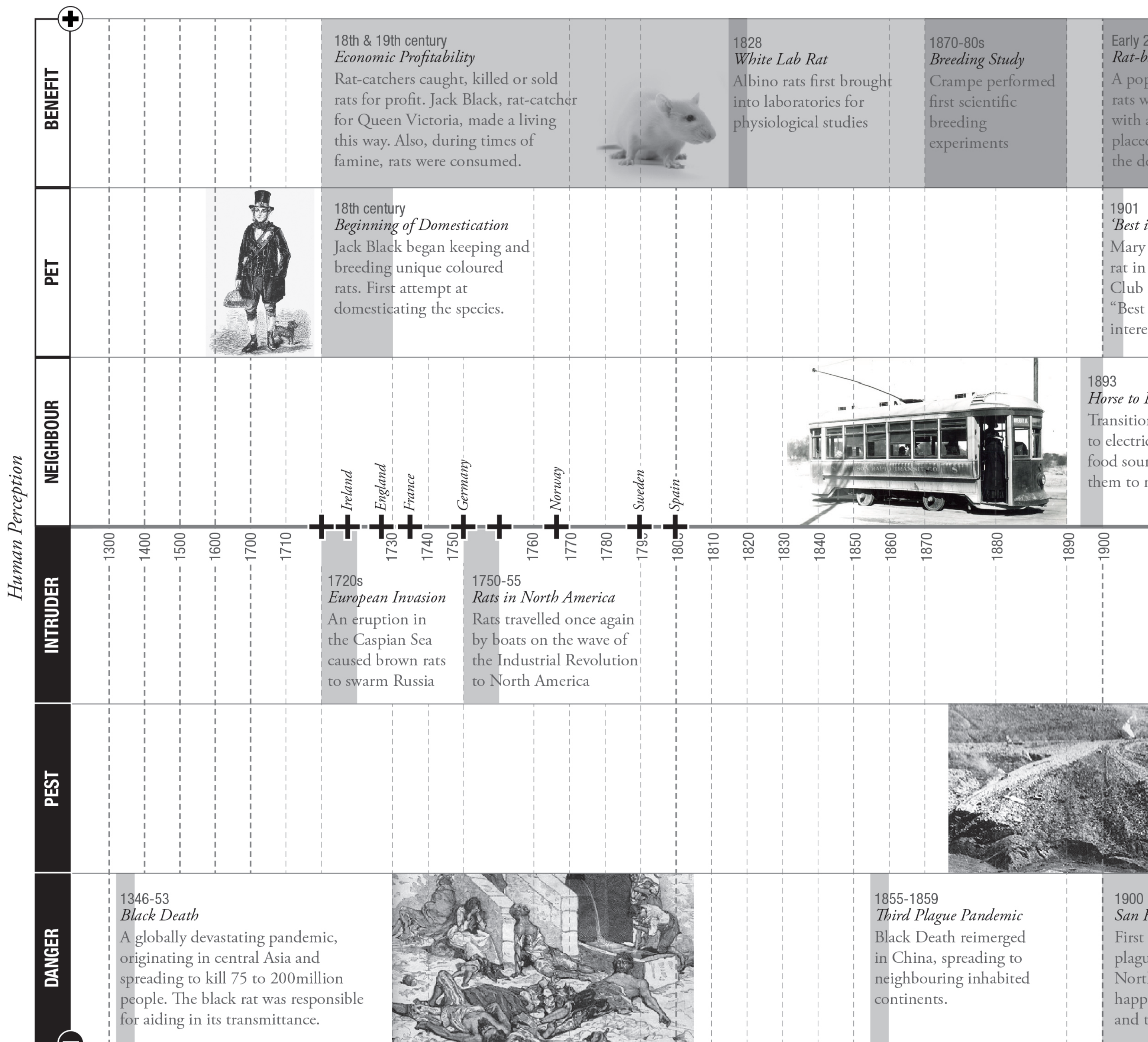


Fig. 2.10. A rat on the tracks of a New York City subway.

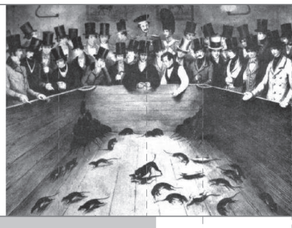
Fig. 2.11. Mickey Mouse versus Mortimer the Rat.

Timeline of Human Perception of the Brown Rat

Fig. 2.12.



20th century
aiting
pular sport where 100
vere placed in a pit
a terrier. Bets were
d on how long it took
og to kill all the rats.



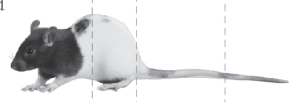
n Show' Rat
Douglas entered her
the National Mouse
exhibition, winning
in Show" sparking
st in Rat Fancy.

1912-1931
National Mouse & Rat Club
Rat fancy formally recognized as a hobby through inclusion into a national club.

1976
Fancy Rat Revival
Rat fancy fell out of fashion only to be revived again in the formation of the National Fancy Rat Society.

Electric Trolly
n from horse-drawn
c trollies eliminated a
rce for rats, causing
migrate into homes.

1947
Identified Rat Breed
Earliest report of existance of wild non-agouti and hooded rats.



2002
Rat-Free Alberta
After a 50 year effort, Alberta is determined to be rat free.

1910 1920 1930 1940 1950 1960 1970 1980 1980 1990 2000 2010 2020

1926
Complete Colonization
Rattus norvegicus successfully inhabited every state in America

1915 to 1930s
Rikkers Island Rat Battle
Island in East River designated as a dump became infested with rats who would then swim to nearby communities.

1951
Alberta Rat Control
Attempted to control population through mass deployment of poisons, and wide-range destruction of infested buildings.

& 1907
Francisco Plague
occurances of the
e epidemic in
h America,
ening first in1900
hen again in 1907

1944-93
American Cases of Plague
Outbreaks of the plague continue to occur, 90% of which are in Arizona, California, Colorado and New Mexico

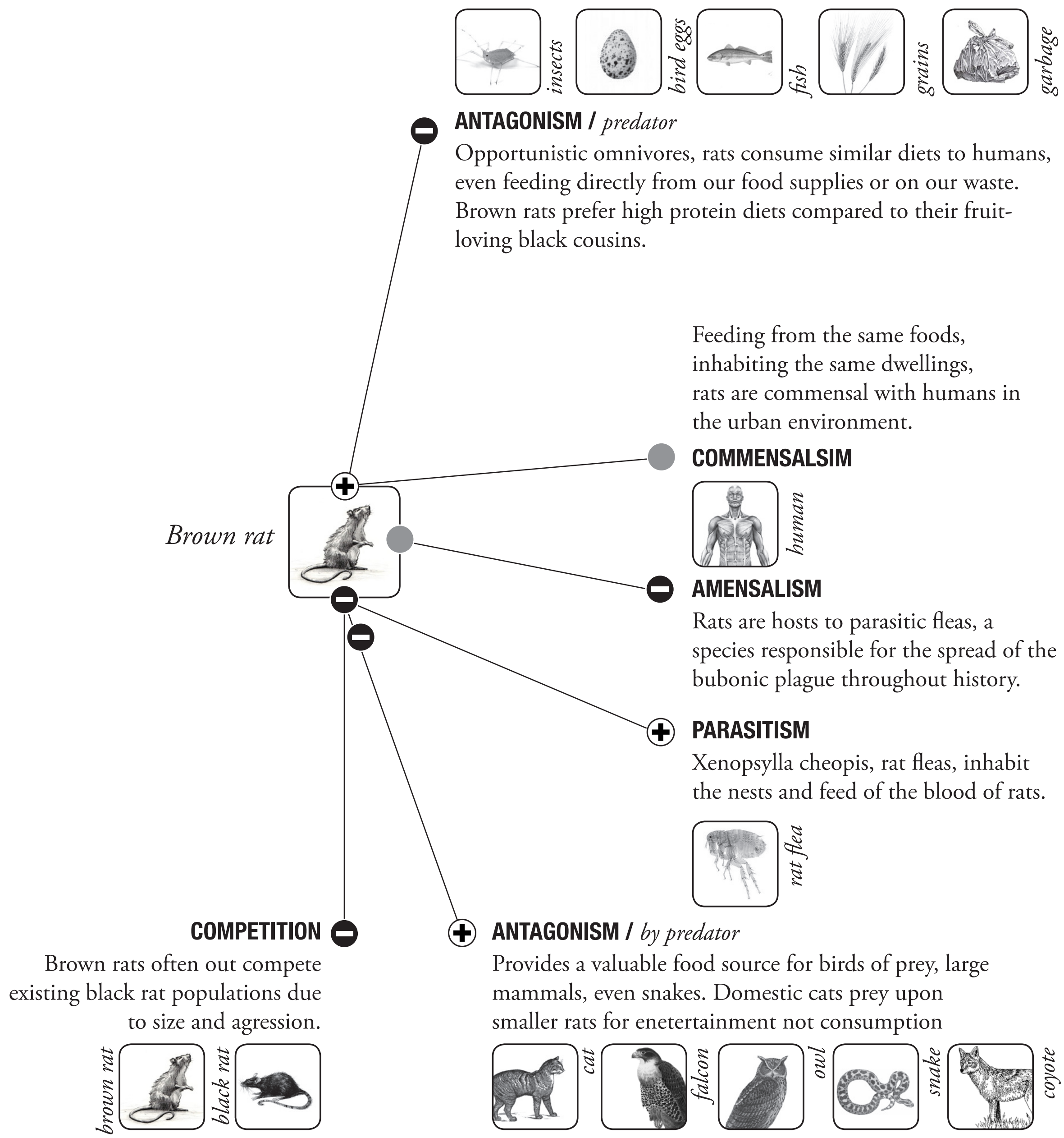
1959-60
1,025 Bites in NYC
Reports identified 1,025 people who had been bitten by rats in NYC, twice that of the U.S. ten top cities combined.

Biological Interactions of the Brown Rat

Fig. 2.13.

Rats are the cultural and biological antagonist within the city. As voracious and unparticular omnivores, rats will consume all matter of edible goods from insects, seeds and grains, to bird eggs, fish and other small mammals. Within the city, rats are never without food thanks to human waste which allows rat populations to grow exponentially. In return for the provision of bountiful feasts, rats throughout history have bestowed upon us diseases such as the bubonic plague however, not through their own actions. The fur and nests of the rat harbour another species, xenopsylla cheopis, a small flea which feeds of the blood of mammals and is the culprate for the plague which killed thousands during the middle ages.

Inspite of their antagonistic role within the urban biome, rats suffer from their own intraspecies antagonization. When populations become too great and overcrowding becomes an issue, rats will even turn on their own kind, cannibalizing fellow city rats. Birds of prey, large mammals, and even domestic cats prey upon the rat as a prime source of protein within the ecosystem of the city. Rats are the equivalent to an ecological hamburger, abundant and delicious to every carnivorous animal.

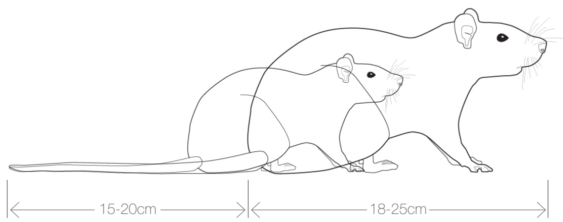

insects
bird eggs
fish
grains
garbage
ANTAGONISM / predator
Opportunistic omnivores, rats consume similar diets to humans, even feeding directly from our food supplies or on our waste. Brown rats prefer high protein diets compared to their fruit-loving black cousins.
Feeding from the same foods, inhabiting the same dwellings, rats are commensal with humans in the urban environment.
COMMENSALSIM
human
Brown rat
AMENSALISM
Rats are hosts to parasitic fleas, a species responsible for the spread of the bubonic plague throughout history.
PARASITISM
Xenopsylla cheopis, rat fleas, inhabit the nests and feed of the blood of rats.
rat flea
COMPETITION
Brown rats often out compete existing black rat populations due to size and agression.
brown rat
black rat
ANTAGONISM / by predator
Provides a valuable food source for birds of prey, large mammals, even snakes. Domestic cats prey upon smaller rats for enetertainment not consumption
cat
falcon
owl
snake
coyote

norway rat

Physical Metrics

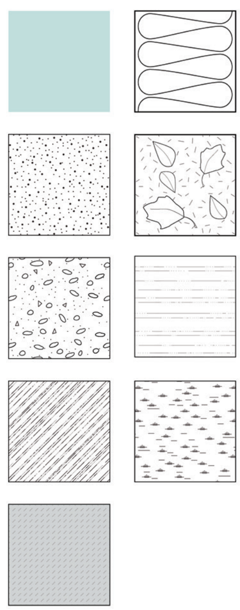
Fig. 2.14.

SIZE RANGE



MATERIAL INTERACTIONS

Navigation Utilization



WATER
capable of swimming, even upstream

DIRT
excellent diggers, burrow for shelter

CONCRETE
capable of gnawing through

WOOD
capable of gnawing through

STEEL
capable of climbing slender poles

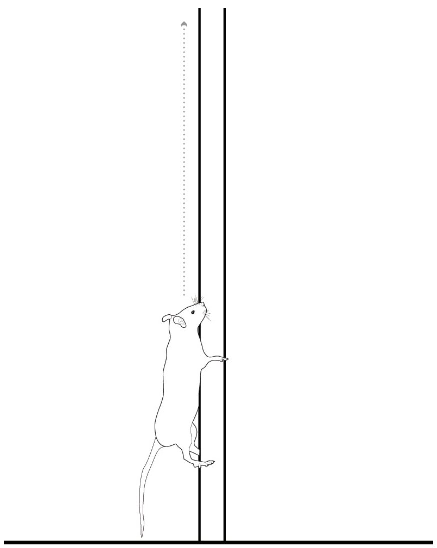
INSULATION
used as nesting material

LEAVES AND DETRITUS
used as nesting material

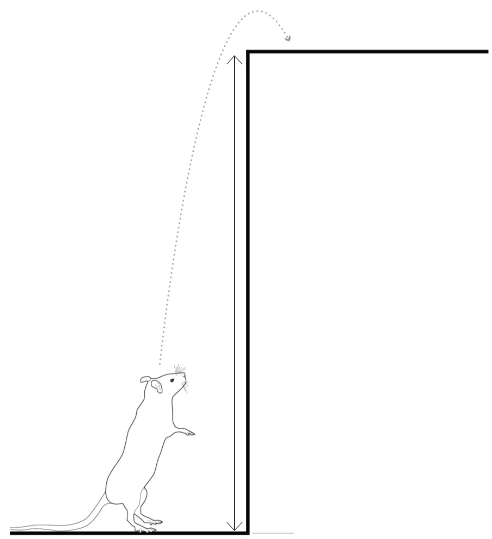
PAPER
used as nesting material

GRASS
used as nesting material

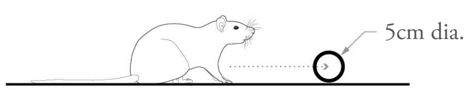
Movement



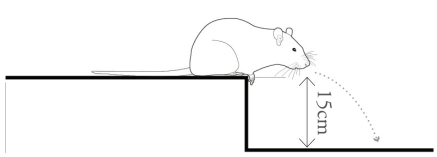
A Capable of climbing



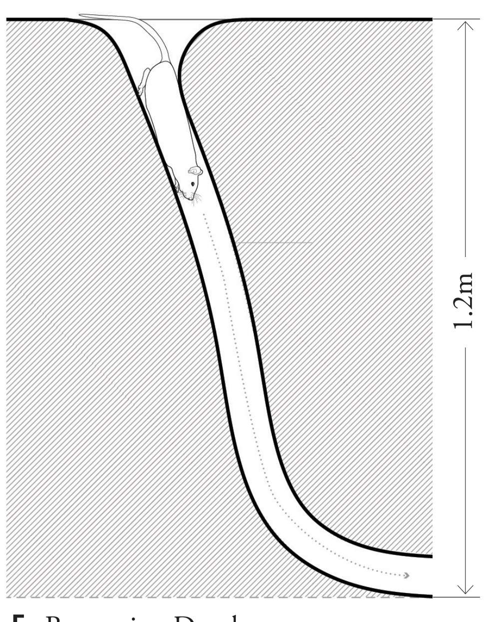
B Jumping Up



C Enter into holes

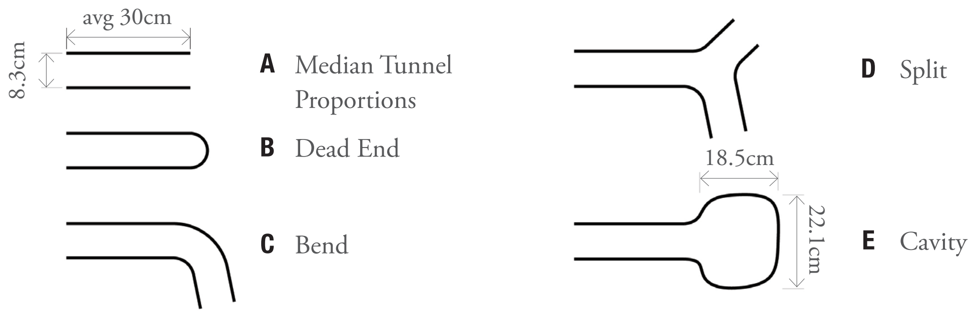


D Jumping Down



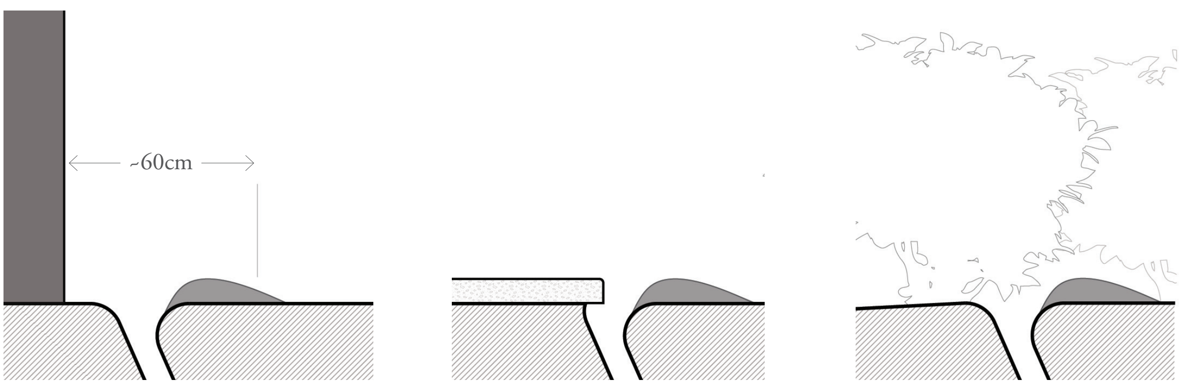
E Burrowing Depth

1.0 *Burrow Construction Types*



2.0 *Burrow Entrance Location*

Typically pregnant females will initiate construction of a nest. She begins by selecting a site in close proxmity to a food source. As she digs, excavated earth is mounded near the entrance.



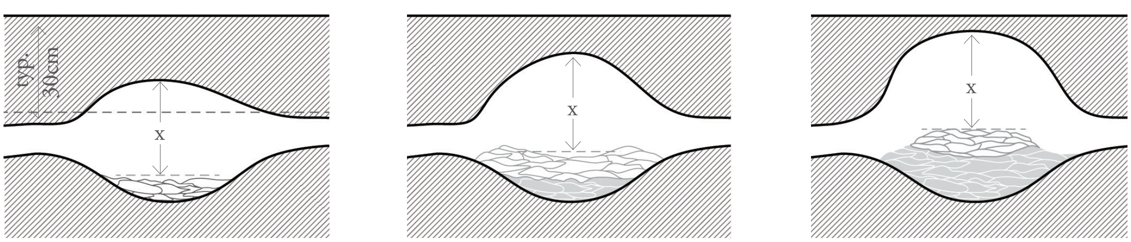
A Against a vertical surface (wall)

B Under a flat surface (sidewalk, boards)

C Under overhead surface (shrubs, raised floor)

3.0 *Cavity Evolution*

Typically pregnant females will initiate construction of a nest. She begins by selecting a site in close proxmity to a food source. As she digs, excavated earth is mounded near the entrance

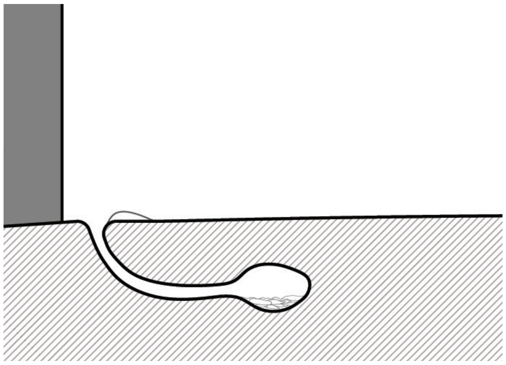


A Bedding is added to a nest cavity. Rats prefer certain distance to the ceiling.

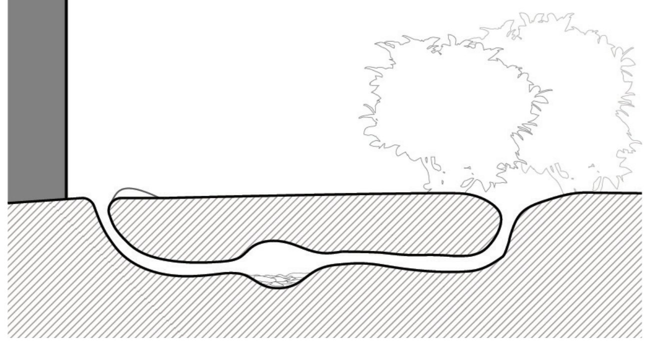
B New bedding is added to cover soiled nest. Ceiling height has to be increased.

C Process is repeated causing cavity to near the surface. At risk of collapsing.

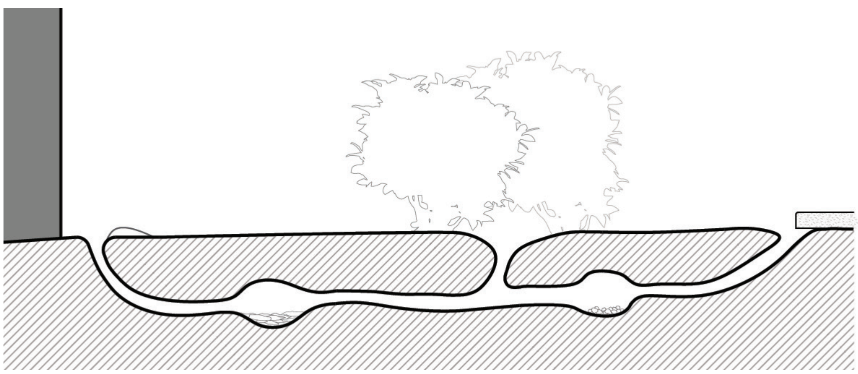
4.0 Burrow Building Process



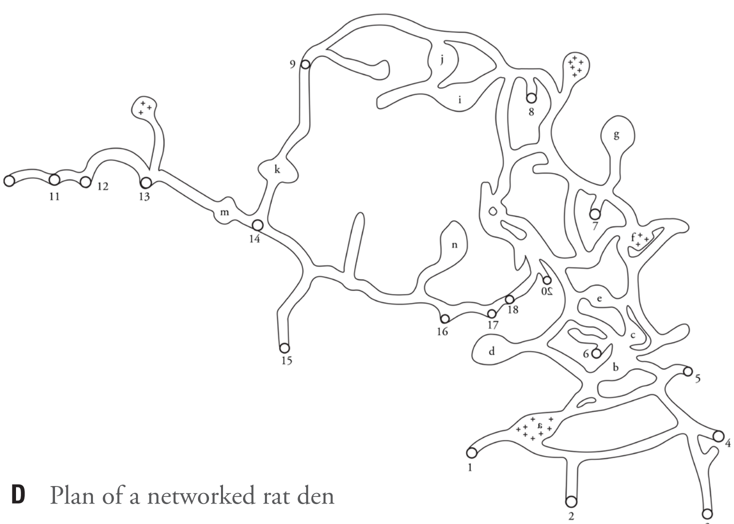
A Once site is selected, digs entrance and tunnel which ends in a nesting cavity.



B After a few days, a second bolt entrance added. No mound of earth is created.



C Second tunnel in constructed typically leading to a food storage cavity. Process is repeated tunnel > cavity > bolt entrance.



D Plan of a networked rat den

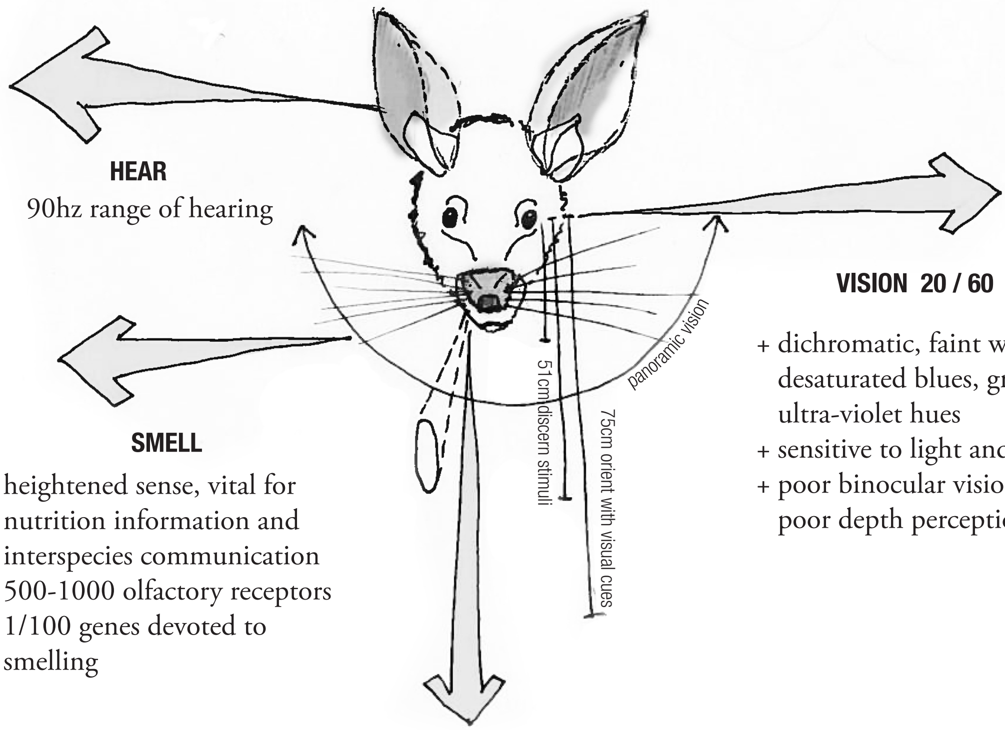
Senses of the Brown Rat

Fig. 2.15.

For the Brown Rat, the urban environment is a dim and blurry reality full of intense smells and damp corners. Rats have poor, binocular vision and therefore have limited visual clarity and depth perception and instead rely upon a high sensitivity to light and shadow for orientation. In addition, their eyes register space in dichromatic colours of desaturated blues, greens and ultra-violet hues giving it a dull appearance compared to human perception.

Humans depend on sight for orientation and perception of their environment. Rats, alternatively, are thigmophilic of "touch loving" animals who perceive space through their tactile senses. Their whiskers are therefore important tools for indicating proximity to objects and surfaces which they use to orient themselves. As a result, rats often move along the edges of a room, using the walls for guidance. Overtime, using their kinesthetic senses, rats develop muscle memory of the various routes through their physical environments.

To compensate for their lack of visual capabilities, rats instead use their acute sense of hearing and smell. Their ears can detect a 90hz range of sound while their nose has between 500 to 1000 olfactory receptors. One in every one hundred genes in a rat's DNA is devoted to the act of smelling. Their sense of smell is vital for detecting contaminants in food and for communication between rats. Inside of their nose, rats have a VNO organ which is used to detect pheromones in urine and secretions which enables intraspecies communications. Daily survival for the brown rat in dependent upon their ability to smell and perceive space through their sense of touch.



HEAR

90hz range of hearing

SMELL

+ heightened sense, vital for nutrition information and interspecies communication
+ 500-1000 olfactory receptors
+ 1/100 genes devoted to smelling

VISION 20 / 60

+ dichromatic, faint with desaturated blues, greens and ultra-violet hues
+ sensitive to light and shadow
+ poor binocular vision therefore poor depth perception

VNO ORGAN

used to detect pharamones in urine and secretions, necessary to communicate

TOUCH

+ thigmophilic species “touch loving”perceive in tactile space
+ whiskers indicate proximity, enable orientation
+ move adjacent to walls and edges to guide them
+ muscle memory and kinesthetic senses build memory of routes through space

Fig. 2.16. Imagined rat umwelt perspective of kitchen from below stove.

The brown rat peers out from its warm, dark hiding spot beneath the stove into the dim and expansive kitchen. Furniture legs, shelving and cupboards blur together in the distance. Smells indicate an abundance of food and garbage is available.

1
VERTICAL SPACE
High shelves are not immediately perceivable but are accessible to the rat because of their ability to climb.

2
TACTILE DIFFERENTIATION
High sensitivity to touch allows the rat to differentiate between smooth tile surface versus textured laminate wood providing orientation and spatial location within the room.

3
PROTECTIVE INTERFERENCE
Table and chair legs as well as the island base interrupt the open floor space of the kitchen providing sheltered spaces beneath which to hide.

4
PHYSICAL INTERRUPTIONS
Rats are warry of changes and interruptions into the physical environment of their preferred passage routes.

5
PROTECTED EDGE
Underside of cupboards provides protection.

Fig. 2.17. Signs perceived by the brown rat.

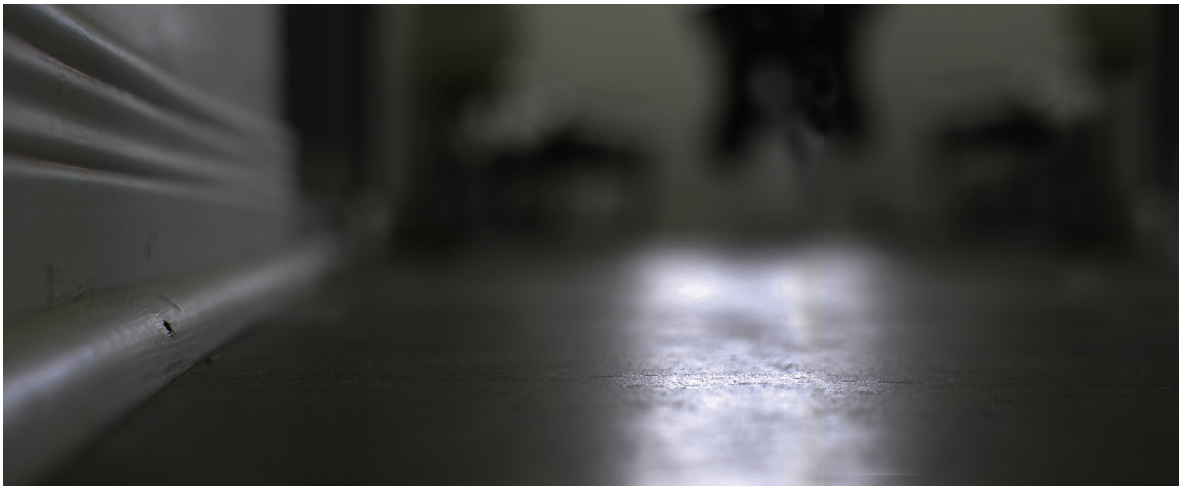
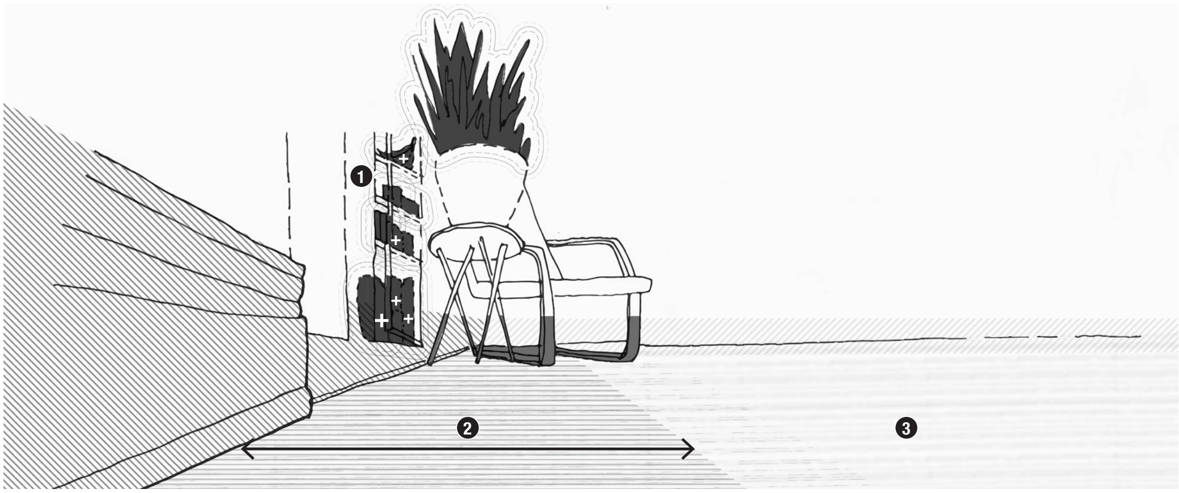


Fig. 2.18. Imagined rat umwelt perspective along baseboard.

The smell of food draws the rat out into the kitchen and along the perimeter of the room. It follows the baseboard, moving its whiskers along the wood for guidance.



1
SCENT ATTRACTOR
Objects which are not visually identifiable but have distinct smells orient the rat and become a food target.

2
PERIPHERAL EDGE ZONE
The base of the wall is used to guide rats through tactile space using their highly sensitive whiskers.

3
UNPERCEIVED
The area and objects beyond the immediate tactile zones may not even register within the rat's perceived inhabitable world.

tactile space
+ scent attractors

Fig. 2.19. Signs perceived by the brown rat.

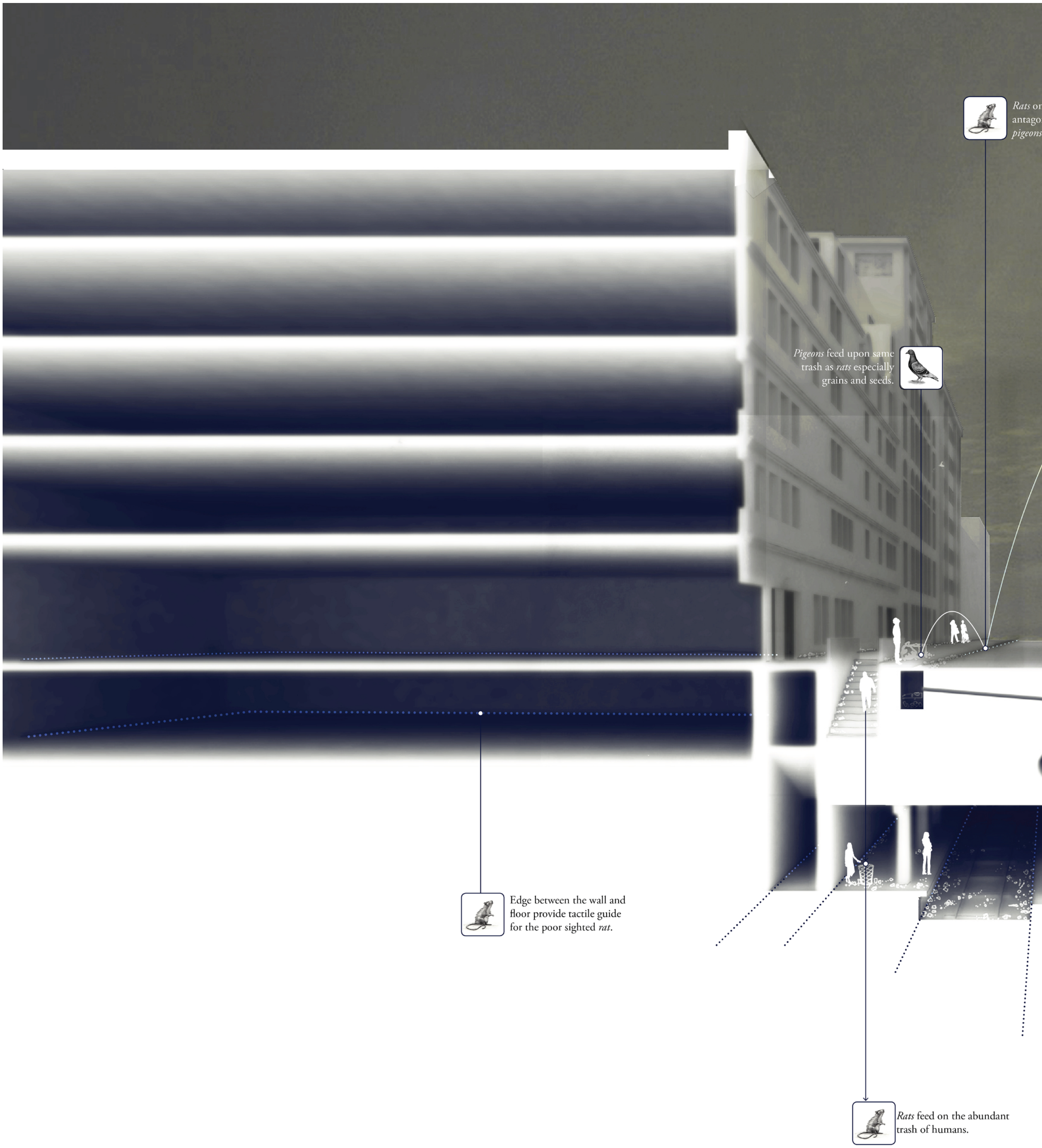
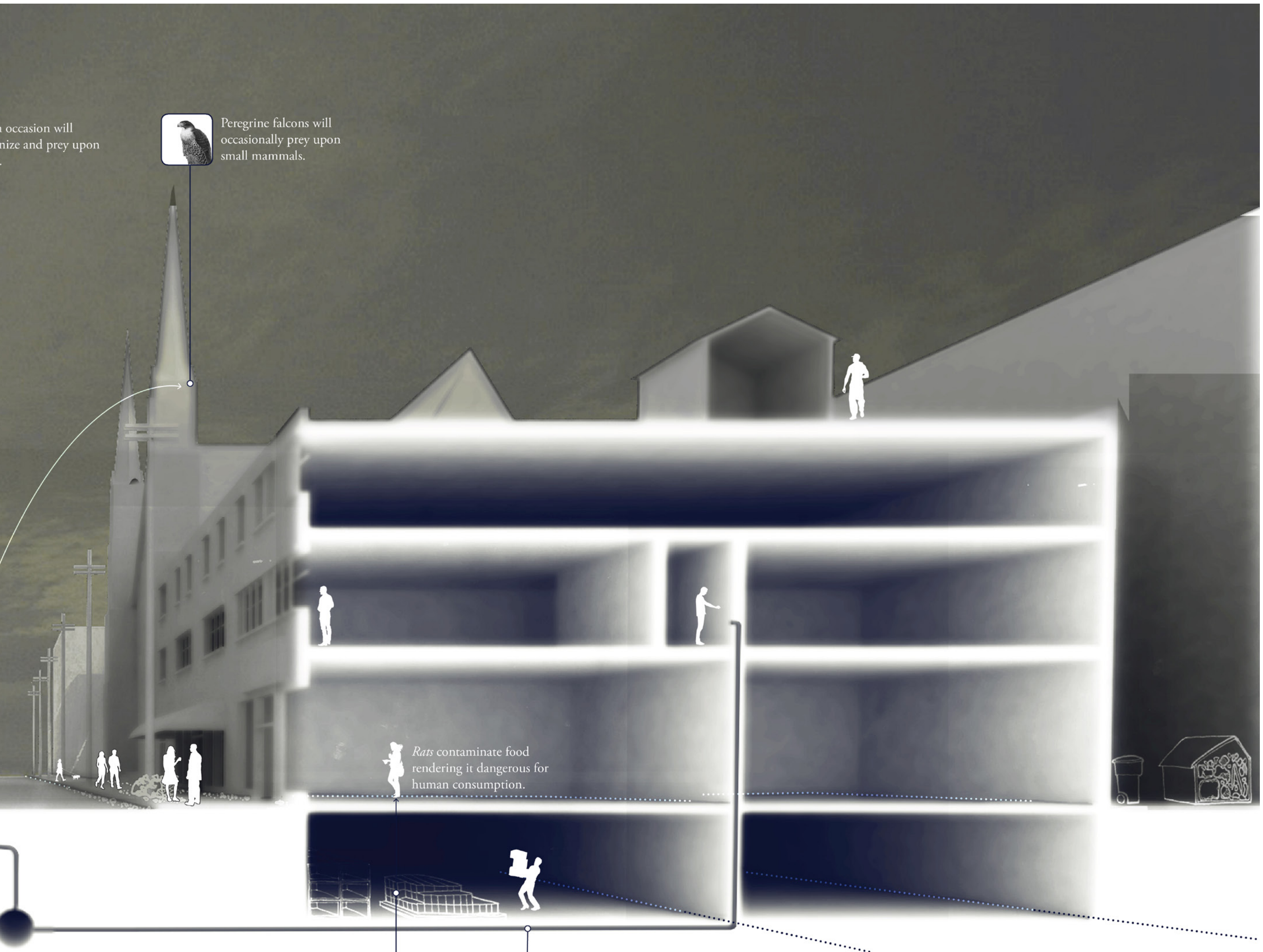
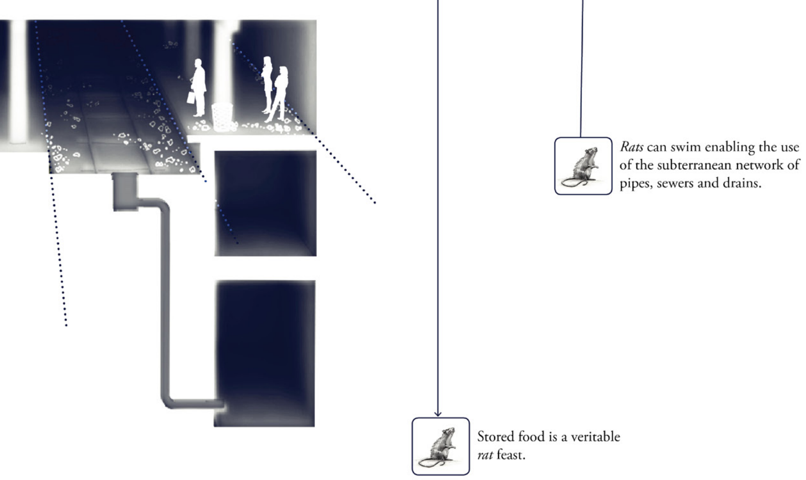
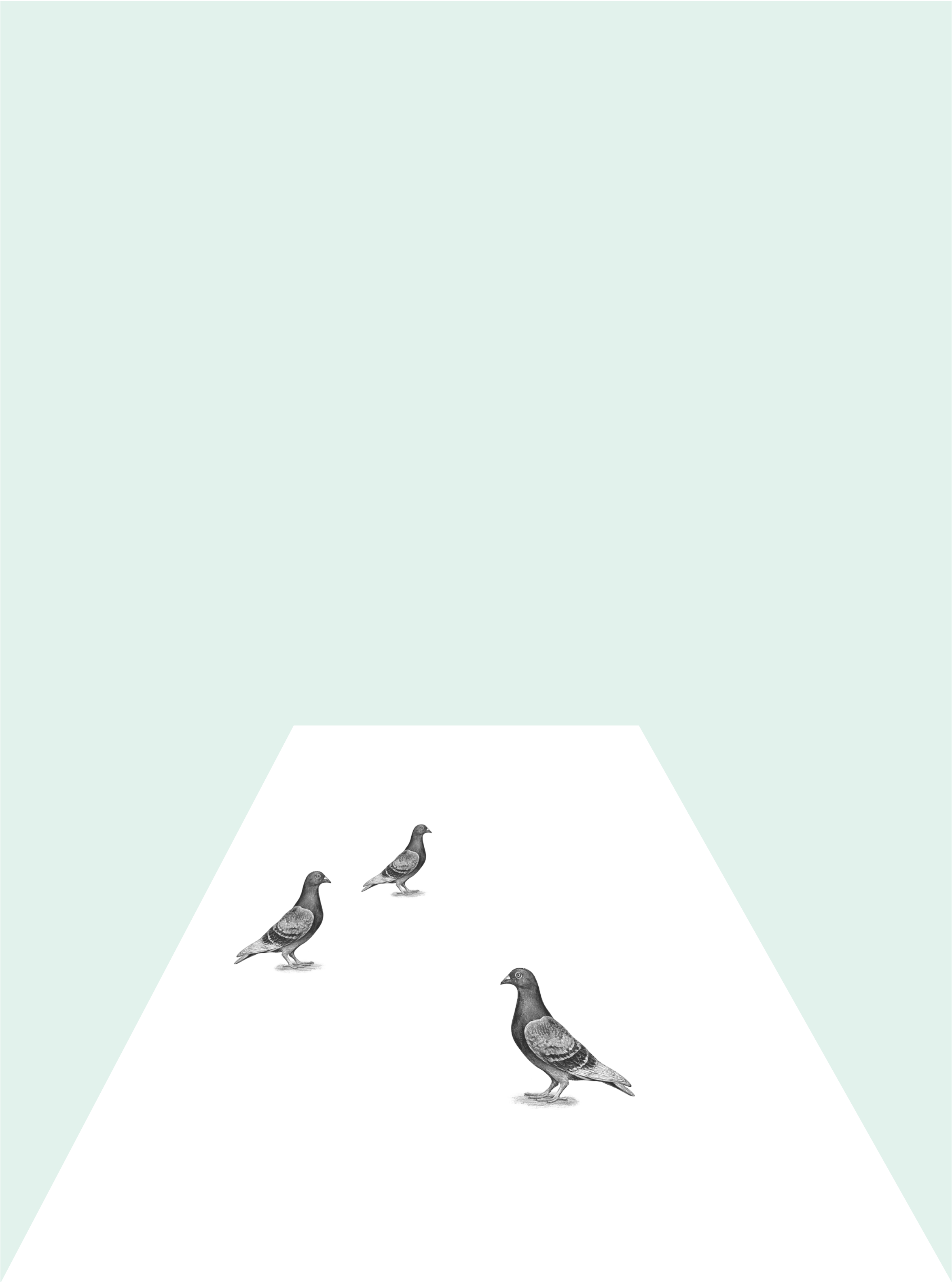


Fig. 2.20. Brown Rat Umwelt Section through Urban Biome.





The drawing cuts a section through a hypothetical city street. It assembles a variety of buildings, a subway station, alleyways, a street, and a large church to outline a prototypical condition to then examine how a rat might perceive and occupy the urban biome. Spaces are rendered in dim, dichromatic colours, edges and tunnels are emphasized as navigational aids, and human refuse is highlighted as a source of food for the brown rat. Biological interactions with pigeons, peregrine falcons and humans are annotated to show the ecological web between species.



FERAL PIGEON

Columba livia domestica

The glow of the morning sun extends over the top of the buildings as it has done for centuries, warming the stone surface of the piazza. A sea of bobbing grey heads are illuminated, pecking hungrily at the remnants of yesterday's lunch. Beady eyes gaze through a pentachromatic colour spectrum at the panorama of urban life, acutely tuned to the passage of humans and the threat of predation. A toddler suddenly stampedes through the field of avian citizens, causing the entire mass to alight, circling above the vast public space before resettling on the ornate architectural details of the surrounding facades. The gregarious group basks in the warmth of the sun, perched upon parapets, window sills, terracotta rooftops and shallow ledges. Shallow metal spikes fail to deter them. Only one thing can draw them away from the social preoccupations, the sight of a familiar human figure who comes to feed them each morning. Corn, safflower seeds and hulled oats are catapulted in the air and come raining down onto the surface of the piazza. In an instant the entire crowd is aflight, flocking towards the veritable feast, scrambling and pecking for delicious morcels, even landing upon the shoulders and hands of the source of their morning meal. Eventually the frenzy subsides and the collective returns to their social activities, that is, until the next urban co-habitant appears with the next meal.

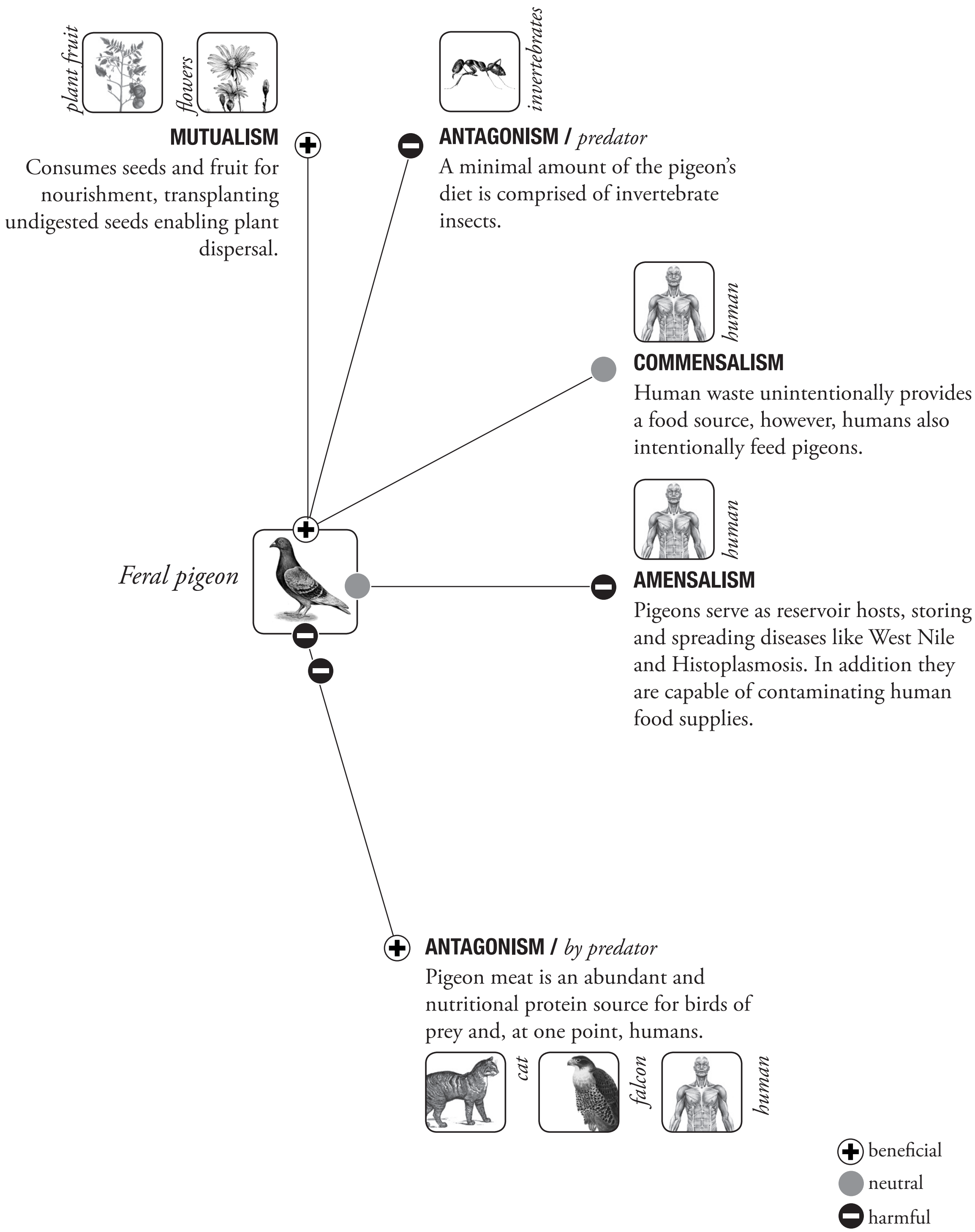
Biological Interactions of the Feral Pigeon

Fig. 2.21.

Within the urban biome, pigeons are often deemed "rats with wings," nearly the lowliest of urban inhabitants. Their ability to thrive in the city is attributed to the abbundance of grains, seeds, garbage and insects available in the urban biome. Discarded crumbs from a morning muffin, remnants of an afternoon lunch, and some stale bread scattered by the old lady in the neighbourhood, ensure there is an abundance of food for the city's pigeons. The act of feeding for many people is a form of ecological interaction within the urban environment. While the general population may sacrifice a morcel of their sandwich to the clever bird who begs at their feet, a few individuals will make a concerted effort to nourish the population of winged creatures. Feeding pigeons is a form of socialization between humans and animals.

Building owners however, despise pigeons because of their untidy nests and the damage caused by their droppings. This aversion to the presence of pigeons is beyond aesthetic. Pigeons are potential transmitters of human afflicting diseases such as histoplasmosis, salmonellosis, and ornithosis. Close interaction with pigeon guano poses risks to human health.

The abundance of urban pigeons, on the other hand, provides food for Peregrine falcons. Falcons will prey upon the juicy bird by swoop ing down from high buildings to strike pigeons with their beaks. It is an agressive end to a mostly docile and timid creature. Thankfully there are plenty more to populate the streets, plazas and rooftops of the urban biome.



plant fruit
flowers
MUTUALISM
Consumes seeds and fruit for nourishment, transplanting undigested seeds enabling plant dispersal.
invertebrates
ANTAGONISM / predator
A minimal amount of the pigeon's diet is comprised of invertebrate insects.
human
COMMENSALISM
Human waste unintentionally provides a food source, however, humans also intentionally feed pigeons.
human
AMENSALISM
Pigeons serve as reservoir hosts, storing and spreading diseases like West Nile and Histoplasmosis. In addition they are capable of contaminating human food supplies.
Feral pigeon
ANTAGONISM / by predator
Pigeon meat is an abundant and nutritional protein source for birds of prey and, at one point, humans.
cat
falcon
human
beneficial
neutral
harmful

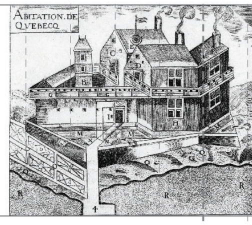
Timeline of Human Perception of the Feral Pigeon

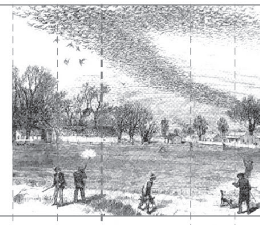
Fig. 2.22.

Human Perception

BENEFIT

1608
Pigeon-loft in Quebec City
Champlain founded Quebec City which contained a pigeon-loft.



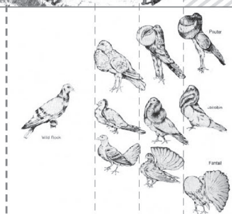


1830's
Toronto Killing Spree
The killing of Passenger Pigeons became a popular sporting activity and the meat was part of the diet

1860's
Professional Netting
Passenger pigeon netting as a viable profession increased with expansion of rail infrastructure.

PET

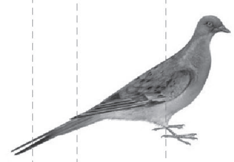
1648
Passenger Pigeon for Dinner
John Winthrop describes how Passenger Pigeons killed en masse to provide early settlers with food.



1836
Darwin's Pigeons
After the Beagle voyage, Darwin kept pigeons to study difference between captive and wild species.

NEIGHBOUR

1606
Pigeons dock in Nova Scotia
Ship docks in Port-Royal, a Champlain-founded colony, containing first rock doves shipped across Atlantic.

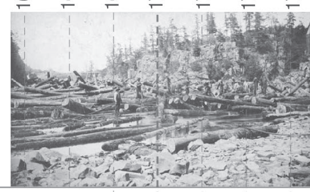


1850's
Noticed Absence
The lack of presence of Passenger Pigeons was noticed in Newfoundland.

1876-
Last
Passe

1600 1610 1620 1630 1640 1650 1660 1670 1680 1690 1700 1710 1780 1790 1800 1810 1820 1830 1840 1850 1860 1870

INTRUDER



1800s
Logging Industry
Emergence of the logging industry reduced available habitat for forest dwelling Passenger pigeons.

PEST

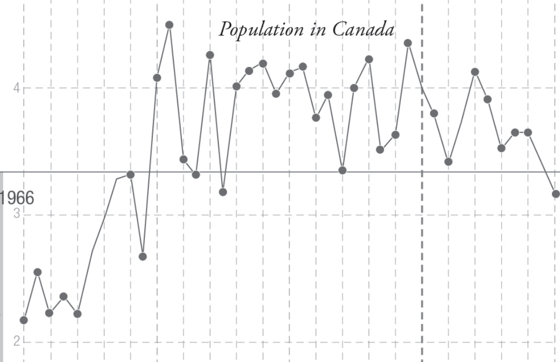
1643
Plymouth Pigeons
Pigeons consumed so much of the regions grain supply it nearly caused a famine.

DANGER

1870's
Missouri to New York
Netters followed flock of pigeons from Missouri to New York, killing the greatest number ever exterminated producing 100 barrels / day.

1914-1918
WWI Army Pigeons
US Army Signal Corps used homing pigeons to communicate vital strategic info.

1939-1945
WWII Army Pigeons
UK employed 250,000 homing pigeons in the war, 32 were awarded Dicken Medal of valor.



Population in Canada

1966
NABS Bird Survey
North American Breeding Society estimates fall in population of pigeons.

-81
Recorded Breeding
nger Pigeons

1897
Protected in Ontario
Passenger pigeons are deemed a protected species by the Ontario government.

1914
Extinct Passenger Pigeons
Last remaining passenger pigeon dies at age 25 in the Cinncinati Zoological Garden.

Post-WWII
Exploding Population
Abundant and cheap human food nourished feral pigeons enabling dramatic population growth.

1880 1890 1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010

1890s
Last Killed
Last two Passenger pigeons to be killed in Toronto.

Feral Pigeon
Passenger Pigeon

Habitat Typologies for Pigeons

Fig. 2.23.

STRUCTURE / *Nest*
Male pigeons will select a crook, nook, or cranny within which to build their nest. The male will then carry pieces of straw, stems and sticks, one by one to the chosen site, and construct a flimsy nest. A monogomous pigeon couple might use the same nest year after year without cleaning it. Overtime the nest solidifies from the compounding of waste, unhatched eggs, and dead nestlings.

SITE / *Naturally occurring*
Native habitat for rock doves is along cliffs and rock ledges where they would roost and breed.

Urban nesting
Ideal locations within the urban biome include building ledges, eaves, overhangs, rain gutters, and abandoned buildings. They evoke the cliff faces of the rock pigeons native habitat.

Roosting space

Pigeons are a gregarious species and like to congregate on wires, ledges, roofs,and open plazas to socialize, feed, and rest.





Sporting shelters

Owners of racing pigeons construct pigeon lofts on the rooftops of buildings where the birds are carefully fed, nurtured, and trained.

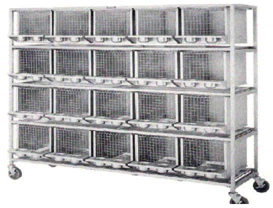


Ornamental houses

With limited access to ecological life within the city, people often construct houses to encourage pigeon inhabitation and populations.


Productive systems

Some societies still consume pigeons as a source of protein and value their guano. They are bred efficiently in factories, or celebrated through the construction of modern dovecotes.


Pigeon Deterrents

Fig. 2.24.

Architectural detailing

The presence of pigeons on the periphery of buildings can be detrimental to the architecture. Pigeon excrement can accelerate the degredation of cladding materials and cause unsightly staining. Nests are aesthetically unappealing for most building owners and, as a result, a variety of pigeon deterrent devices have been designed for the consumer market.

Daddi Long Legs

Thin gauge metal rods with plastic end caps wave in the wind, scaring birds from landing on the open space which it is protecting.

Bird spikes

A strip of thin stainless steel spikes attached to ledges, parapets, signage, beams, chimneys, recesses, and lights to prevent pigeons roosting or nesting there.

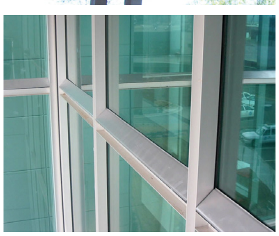
Bird coil

Similar principle as the bird spikes. A long, stainless steel coil is extended across long ledges and parapets creating a de-stabilizing condition for roosting.

Sloped Edge detail

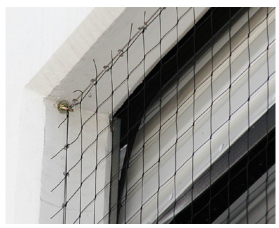
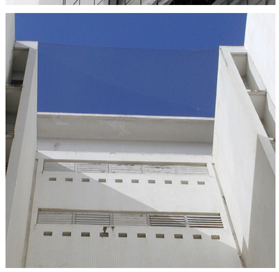
Sloped metal edge detail for building ledges to prevent birds from being able to occupy ledges due to the slope and smooth surface.





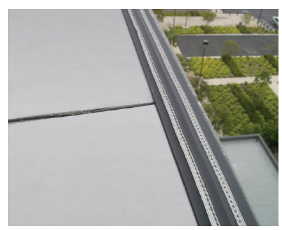

Bird netting

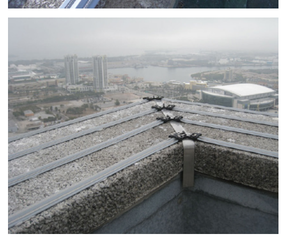
Steel attachments anchor a polyethylene twine netting which excludes pigeons (and all other birds) from accessing the facade of the building. Functions best across enclosed and semi-enclosed spaces.


Electrified track

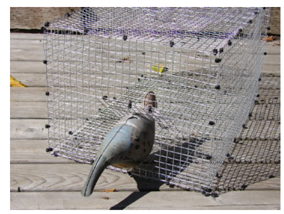
A low profile, electrified track enclosed in a PVC casing conditions pigeons through fear and flight. The electric current hurts but doesn't harm the birds, however it does discourage them from landing there.



Live trap

Traps capture and allow humans to relocate the pigeons. However, this does not eliminate the problem entirely as pigeons will continue to return.



Senses of the Feral Pigeon

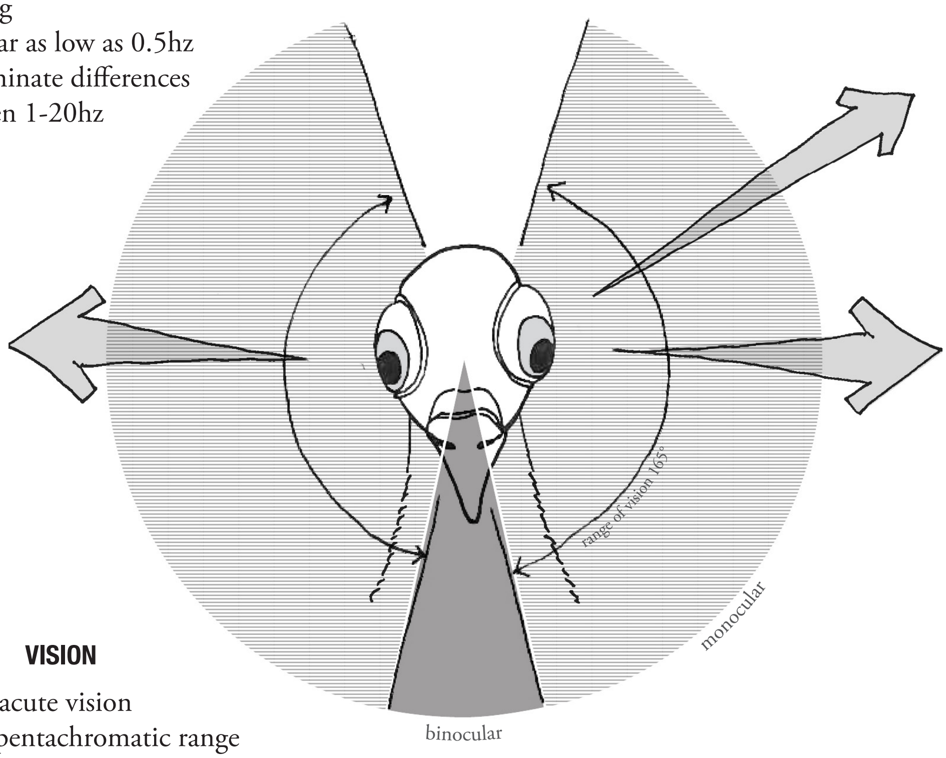
Pigeons have acute vision with a wide monocular range. They have twice as many visual receptors as humans, allowing them to see their environment in pentachromatic colour. Their sharp visual sense enables pigeons to perceive their environment in high detail while flying at significant speeds. Pigeons use different processes to perceive space when on the ground. A pigeon will move its head forward and backward as it walks, in order to stabilize their visual surrounds. Pigeons rely on this movement to perceive their environment unlike humans who move their eyes to catch and hold images.[1]

In addition to their sharp sense of sight, pigeons have expert hearing which allows to perceive sounds as low as 0.5hz. Pigeons have also been found to hear infrasonic sounds which means they are capable of sensing the vibrations of the earth. Many believe that this ability is what allows homing pigeons to navigate and deliver messages, a service they have provided for over 3000 years.[2]

A pigeon is capable of flying at speeds up to 100km/h and reaching altitudes over 1800m. Its airborne agility necessitates high levels of visual and audible senses which allow it to perceive its environmental surroundings.

HEARING

+ capable of hearing infrasonic, vibrations of the earth
+ believed to orient for homing
+ can hear as low as 0.5hz discriminate differences between 1-20hz



VISION

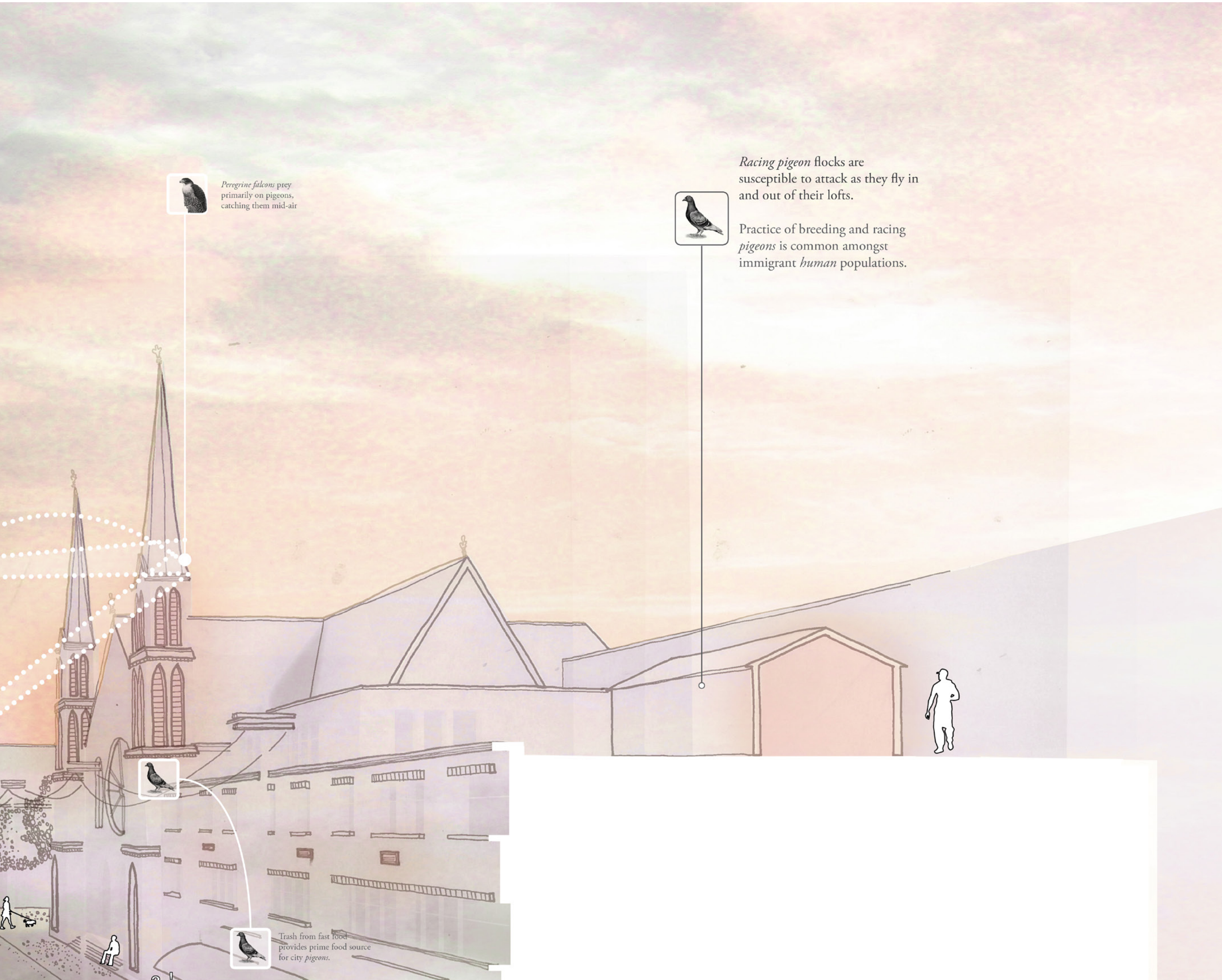
+ sharp, acute vision
+ see in pentachromatic range
+ twice the receptors of humans
+ wide monocular range
+ limited monocular vision causes pigeons to bob heads to compensate for lack of depth perception

FLIGHT

+ reach altitudes over 1800m
+ speeds up to 100km/hr over short distances

Fig. 2.25. Sensory percetions of a Pigeon

Fig. 2.26. Feral Pigeon Umwelt Section through Urban Biome



For flocks of feral pigeons, the city is perceived as an environment of ledges, commercial signs, vents and wires available for roosting and nesting. Their wide, monocular vision allows them to detect the presence of predatory birds. Discarded fast food meals and other detritus which litter the street ensure an abundance food for the pigeon.

RACCOON

Procyon lotor

Darkness comes and a hush falls over the city. Most urbanites are peacefully asleep in their homes, but not the common raccoon, for her, night signifies adventure. A mother Procyon lotor emerges from her nest in the attic through a hole beneath the eave and sets out in search of dinner. For this urban omnivore, the pursuit is a laughable matter. She ambles down the drain pipe head first, with her young following close behind. She strolls along the driveway to the green plastic bin positioned at the curbside hours before. Rising onto her hind legs, she places her paws against the side and leans in. It topples over with ease. With dexterous paws, shes pries open the latch and out tumbles a veritable raccoon feast; vegetable scraps, apple cores, and bread crusts, orange peels, half eaten pizza, even a chicken bone or two. The kits giggle and chirp with delight, gorging till their hearts content. After a satiating dinner the clever bandits take to the garden for some recreation, digging for grubs, frolicking on the deck, and snacking on the vine-ripening strawberries. Suddenly their raucous comes to a halt. A disgruntled homeowner, awakened by the noise, turns on the patio light to locate the cause of the commotion. But by then, the rambunctious bunch has skited away, back to the safety of the attic where they'll lounge lethargically through another day.

Proto-Algonquian language allocates the procynae with a name meaning *the one who rubs, scrubs and scratches with his hands,* *"ahrah-koon-em"*

Upon discovering the mammal in his adventures in North America in 1612, Captain John Smith, the notorious English explorer, roughly translated the indigenous name as

"aroughcun"

In the late 16th century William Strachey, writer and early North American colonizer, dubbed the dexterous and cunning creature *"arathkone"*

The Olmec and Mayans of Mesoamerica cultivated maize as a primary food source and by 2500 BC the hearty crop had spread throughout the Americas.[10] The leafy stalk produces oblong ears of corn in a protective exterior husk. Carefully pealing it back reveals the deliciously sweet, golden kernels within, a delicacy for the common raccoon. The expansive cultivation of maize throughout North America begins the story of the proliferation of *ahrah-koon-em.*

Accounts from the Pre-Columbian era depict raccoons happily inhabiting limited regions near rivers and woodlands in the South-Eastern United States.[11] The arrival of European explorers in 1492 catalyzed the colonization of North America by both human and procyonidae settlers. New-comers claimed land, constructed barns and cultivated corn to feed and shelter themselves. What they didn't realize was that they had house guests. Raccoons had also taken to living in their barns attics, and feeding on their corn crops. As the settlers expanded to claim new territories, the clever raccoons followed closely behind, gradually expanding their occupation of North America alongside humans.

The Industrial Revolution initiated a transformation of the North American landscape into larger, more dense, metropolises. People migrated from rural countrysides into booming industrial cities in search of work and new life, so did raccoons. Since maize couldn't be found amongst the concrete expanse of the urban environment, raccoons found a new source of food, trash. The end of WWII initiated a migration to the suburbs. The urban periphery was speckled by single detached houses, the perfect place for the nuclear family and their nocturnal friend. The prototypical construction of pitched roofs sheltered both children and kits, grassy backyards invited all-species to play, and any food that was not finished by one, became dinner for the other. The human narrative of the settlement of North America is shared with the common raccoon.

Timeline of Human Perception of the Common Raccoon

Fig. 2.27.

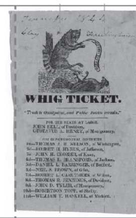
Human Perception

BENEFIT

1573
Hunted to Death
Spanish colonists in Hispaniola hunted raccoons for food to the point of extermination.

1687
Carribean Extermination
Eliminated in Cuba and Jamaica.

PET



1830's
Political Emblem
American Whig Party used the raccoon as an emblem of their political party gaining them the name "coon."

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NEIGHBOUR

1492-1503
First Siting in Americas
Sited by members of Christopher Columbuss expedition to the Americas.

1920's
First Urban Siting
Raccoon identified livin in a suburb of Cincinnati.

1400 | 1500 | 1600 | 1700 | 1800 | 1810 | 1820 | 1830 | 1840 | 1850 | 1860 | 1870 | 1880 | 1890 | 1900 | 1910 | 1920 | 1930

1934 *Germany*

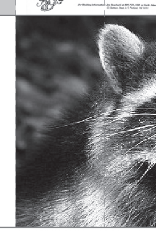
INTRUDER

PEST

1830's
Derogatory "Coon"
Whig Party was criticized for their sympathetic position towards Afro-Americans, "coon" became a derogatory term for African American people.

1880-1920
Coon Tunes
A genre of music which was racially derogative towards African American people.

DANGER



1936-1958
Soviet Hunting
1,240 released to be hunted for fur seasonal harvest of 1,000-1,500.

1954
Labelled Game Animal
In 14 of the German states, raccoons are listed as a game animal, available for hunting.

4
s Released in Germany
o pairs of pet coons were released o the German ntryside to diversify na.

1954-55
Davey Crockett: King of the Wild Frontier
Disney's Davey Crockett TV series sparked a demand for coonskin caps by adolescent boys.

1977
"Rascal the Raccoon"
Popularity of anime series in Japan sparks import of 1,500 raccoons as pets.

1995
Disney Pocahontas
Features Meeko her beloved pet raccon.

ng

1945
Escaped during Air Strike
25 escaped from a fur farm east of Berline after an air strike.

1950's
Raccoon Urbanization
Area of urban occupation expanded to include Washington, Chicago, and Toronto.

1966
Set Free in France
Pet raccoons brought by U.S. Air Force crew were released at the Laon-Couvron Air Base in France.

1985-1991
The Raccons
A Canadian animated television series.

2006
Mr. Porter
A raccon becomes the mascot for Porter Airlines.

1940 | 1941-57 *Azerbaijan* | 1950 | 1954-58 *Belarus* | 1960 | 1966 *France* | *Hessian, Germany* Pop 20,000 | 1970 | *Caucasus Region* Pop 20,000 Density 4/km^2 | 1977 *Japan* | 1980 | 1990 | 2000 | *Germany* Pop 200-400k | 2010 | 2020

Dong Nguyen Attack
Toronto resident arrested for attacking baby raccoons in his backyard sparking controversy.

2008
Inhabitation of Japan
All 47 prefectures of Japan are inhabited by raccoons.

1950's
Spread of Rabies
Began in Florida and Georgia, spread through introduction of infected raccoons to Virginia, North Dakota, through the late 1970's.

2006
37.7% of Cases
Of 6,940 documented cases of rabies in the U.S., 37.7% were in raccoons.

Cultural Iconography

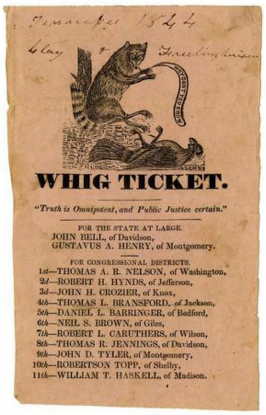
By the early 20th century, the physical presence of the raccoon was felt within the city, however, the cultural relationship with it originated with the indigenous peoples. Native American mythology often personifies the raccoon as a mischief-maker, full of trickery, secrecy and deception. His mask and ringed tail marked him as a bandit. However in certain lore, he's lauded for his curiosity, adaptability and resourcefulness. While perception may oscillate, the raccoon's presence in cultural and ecological history is certain.

The Whig Party, a political organization in the 1830's were the first to adopt the raccoon as its emblem which eventually garnered them the nickname "coons." The party was highly criticized for being sympathetic to black people and so the term evolved into a derogatory name for African-Americans. An entire genre of music called Coon Tunes emerged from it that promoted racism through song and imagery. In the late 1950's the term was exported to South Africa where it was adopted without the derogatory implications by groups such as the *Golden City Dixies*.

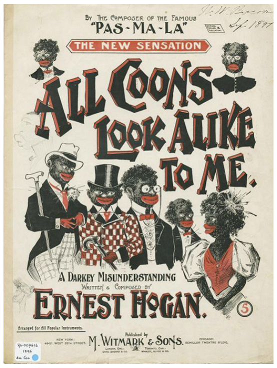
The household television brought *Davey Crockett: King of the Wild Frontier* into the homes of adventurous young boys. Crockett's coonskin hat subsequently became a widely desirable commodity.

Throughout the last four decades, the raccoon has repeatedly appeared in television shows, animated films, and video games usually as a curious character with highly dexterous paws and a devious spirit. In 2006, Porter Airlines adopted Mr. Porter, a suave, traveling raccoon, as their mascot. Why a raccoon? For "its reputation as a smart and cheeky creature," of course. It's fitting for the urban airport of a city which has been dubbed the raccoon capital, Toronto.

1830'S
Whig Political Party Raccoon Emblem



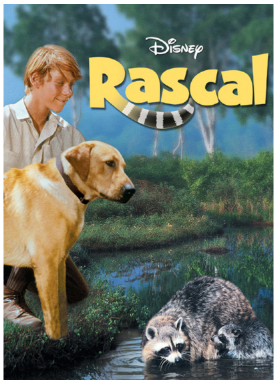
1880 - 1920
Racially derogative posters for Coon Tune music



1954-55
Davey Crockett: King of the Wild Frontier

1959
Coon Carnival by the Golden City Dixies, in South Africa.

1969
Rascal, a Disney remake of a Sterling North book



1985 - 1991
The Raccoons, a Canadian animated television series

1995
Meeko
from Disney's Pocahontas

2002
Sly Cooper, Playstation Video Game Character

2006
RJ in Over the Hedge, a Dream Works film featuring the antics of suburban wildlife

2006
Mr. Porter
a traveling raccoon

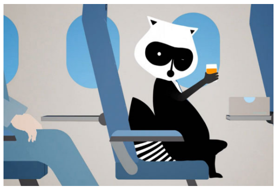


Fig. 2.28. Cultural iconography of the raccoon.

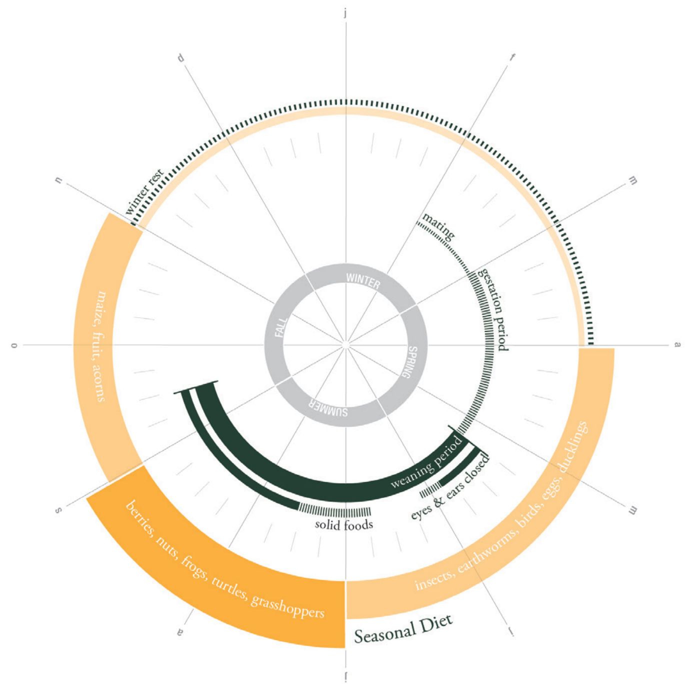
"[A] prominent feature of urbanization is the differences in lifestyle...changes in food habits, physical activity, work patterns... but also sexual behaviors, leisure time activities and traveling patterns."[12]

She had moved to the city from her family's home on a rural farm and quickly noticed, the city dwellers were different. Accustomed to solitude, interjected by interactions with immediate relatives, she found the gregarious nature of the urbanites alarming. Together they housed, dined, and socialized with other females, living much of their lives as a collective. She noted that they rarely traveled beyond a limited territory, seemingly confined by an invisible boundary. Everything they needed was close at hand, a variety of housing opportunities, an abundance of food choices. Maybe they just had no reason to leave?

Moving nimbly through the city, she could see the affects of their glutenous and indolent lifestyle. The urban inhabitants ambled lethargically, without anxiety or fear, from one local spot to the next. It appeared to her that with such a bountiful supply of resources available, they relished in it, becoming portly and nearly inert.

As winter came and the air grew colder, their patterns remained the same. Her natural inclination towards torpor, achieving a restful state of inactivity, seemed absent in them. Each icy, winter night they'd depart from the warmth of domesticity and ramble along through the city on their next adventure, unaffected by season or weather.

Mating season came early in the city. Before she realized what was happening, she had a plethora of potential suitors vying for her attention. With the population so dense within the city, she could have her pick of Toronto's male raccoons. Maybe she too could adapt to life in the Raccoon Capital of the World.



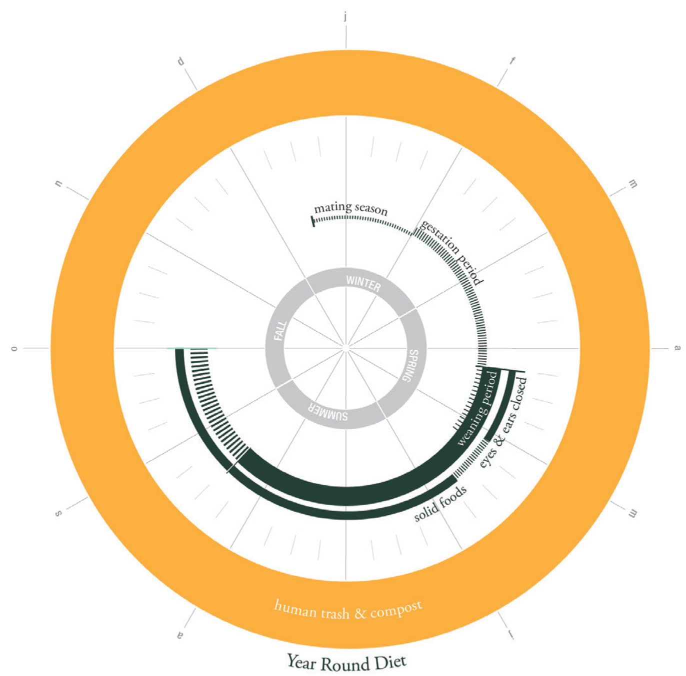


Fig. 2.29. Rural Raccoon Seasonal Cycle
Fig. 2.30. Urban Raccoon Seasonal Cycle

"Toronto is the raccoon capital of the world"

Fig. 2.31. Toronto News Articles on Raccoons.

June 1, 2011

NATIONAL POST

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NEWS › TORONTO

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TRENDING It-Happened-In-Canada | Israel | Ford | Ebola | Ukraine | Subban | Iraq | Coyne | Blatchford

Man arrested for allegedly attempting to kill raccoons with a shovel

JESSICA HUME | June 1, 2011 10:53 AM ET
More from Jessica Hume

Republish Reprint

A raccoon steals food from a cat's dish on a west-end Toronto porch, Monday afternoon, April 18, 2011 in Toronto Aaron Lynett / National Post

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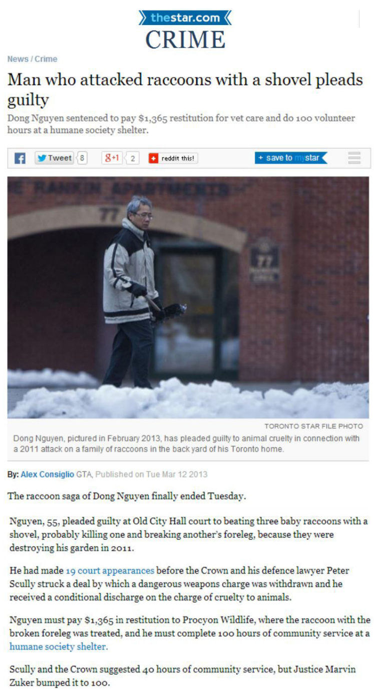
A 53-year-old west-end resident has been charged with attempting to beat a family of raccoons to death with a shovel.

Dong Nguyen was arrested after an alleged skirmish Wednesday morning in the yard of his home on Rankin Crescent near Bloor Street and Lansdowne Avenue.

Just before 6 a.m., neighbour Roddy Muir ran into his backyard after hearing screams coming from the property next door. "I climbed to the top of the fence to see what was happening and I saw tiny little raccoons cowering," he said. "One of them was absolutely smashed in and screaming horrifically."

March 12, 2013



thestar.com

CRIME

News / Crime

Man who attacked raccoons with a shovel pleads guilty

Dong Nguyen sentenced to pay $1,365 restitution for vet care and do 100 volunteer hours at a humane society shelter.

Tweet 8 | +1 2 | reddit this! | + save to mystar

TORONTO STAR FILE PHOTO

Dong Nguyen, pictured in February 2013, has pleaded guilty to animal cruelty in connection with a 2011 attack on a family of raccoons in the back yard of his Toronto home.

By: Alex Consiglio GTA, Published on Tue Mar 12 2013

The raccoon saga of Dong Nguyen finally ended Tuesday.

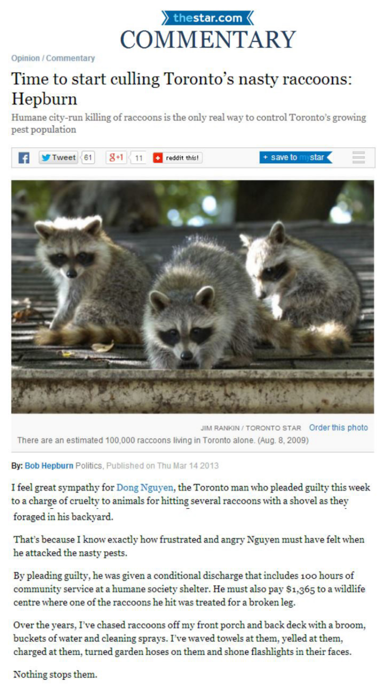
Nguyen, 55, pleaded guilty at Old City Hall court to beating three baby raccoons with a shovel, probably killing one and breaking another's foreleg, because they were destroying his garden in 2011.

He had made 19 court appearances before the Crown and his defence lawyer Peter Scully struck a deal by which a dangerous weapons charge was withdrawn and he received a conditional discharge on the charge of cruelty to animals.

Nguyen must pay $1,365 in restitution to Procyon Wildlife, where the raccoon with the broken foreleg was treated, and he must complete 100 hours of community service at a humane society shelter.

Scully and the Crown suggested 40 hours of community service, but Justice Marvin Zuker bumped it to 100.

March 14, 2013



thestar.com

COMMENTARY

Opinion / Commentary

Time to start culling Toronto's nasty raccoons: Hepburn

Humane city-run killing of raccoons is the only real way to control Toronto's growing pest population

Tweet 61 | +1 11 | reddit this! | + save to mystar

JIM RANKIN / TORONTO STAR Order this photo

There are an estimated 100,000 raccoons living in Toronto alone. (Aug. 8, 2009)

By: Bob Hepburn Politics, Published on Thu Mar 14 2013

I feel great sympathy for Dong Nguyen, the Toronto man who pleaded guilty this week to a charge of cruelty to animals for hitting several raccoons with a shovel as they foraged in his backyard.

That's because I know exactly how frustrated and angry Nguyen must have felt when he attacked the nasty pests.

By pleading guilty, he was given a conditional discharge that includes 100 hours of community service at a humane society shelter. He must also pay $1,365 to a wildlife centre where one of the raccoons he hit was treated for a broken leg.

Over the years, I've chased raccoons off my front porch and back deck with a broom, buckets of water and cleaning sprays. I've waved towels at them, yelled at them, charged at them, turned garden hoses on them and shone flashlights in their faces.

Nothing stops them.

"You can't refute that there is a raccoon issue in the city, but there are more humane ways to deal with it."
- Const. Drummond

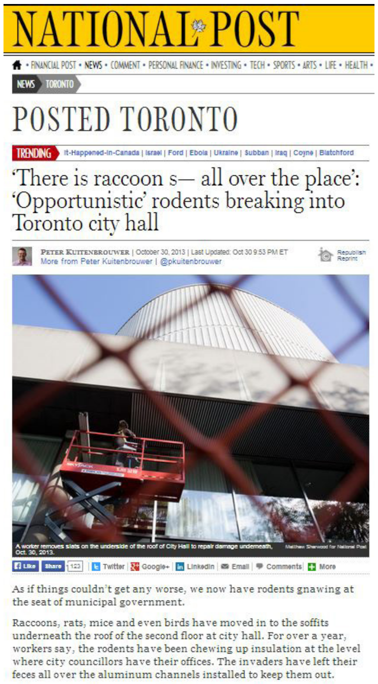
"I was shocked and appalled... this is barbaric cruelty, which has no place in our society or in this neighbourhood." [13]
- Nanette Lang

After 19 court appearances, Dong Nguyen is sentenced to 100 hours community service and $1,365 in restitution for care.[14]

"Nothing stops them. At night, they try to rip their way into my secured garbage and green bins...they tear up my...lawns almost nightly in search of grubs.

I've never actually hit a raccoon, but I've sure felt like it."[15]

October 30, 2013



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‘There is raccoon s— all over the place’: ‘Opportunistic’ rodents breaking into Toronto city hall

PETER KUITENBROUWER | October 30, 2013 | Last Updated: Oct 30 9:53 PM ET
More from Peter Kuitenbrouwer | @pkuitenbrouwer

Republish Reprint

A worker removes slats on the underside of the roof of City Hall to repair damage underneath, Oct. 30, 2013. Matthew Sherwood for National Post

Like Share 123 | Twitter | Google+ | LinkedIn | Email | Comments | More

As if things couldn't get any worse, we now have rodents gnawing at the seat of municipal government.

Raccoons, rats, mice and even birds have moved in to the soffits underneath the roof of the second floor at city hall. For over a year, workers say, the rodents have been chewing up insulation at the level where city councillors have their offices. The invaders have left their feces all over the aluminum channels installed to keep them out.

Raccoons, rats, mice and even birds have moved in to the softs underneath the roof of the second floor at city hall.

“We have six weeks' work, three crews, and it's all for the rodents” [16]
- Alvaro Vallardes

April 9, 2015

NATIONAL POST

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TORONTO

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Watch a raccoon try to open the new green bin for Toronto, designed to ‘defeat the forces of the raccoon nation’

ASHLEY CSANADY | April 9, 2015 5:08 PM ET
More from Ashley Csanady | @AshleyCsanady

Republish Reprint

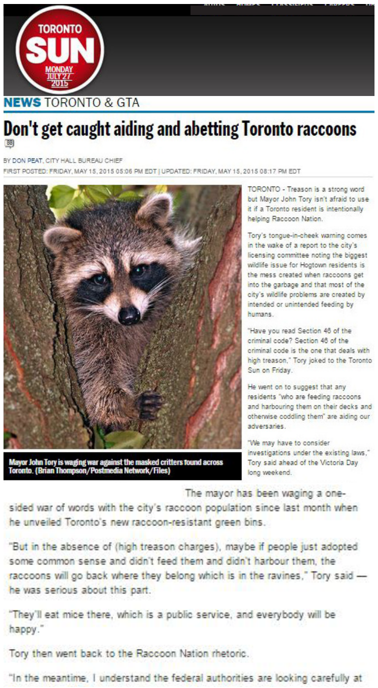
Public works chair Jaye Robinson says a new green bin may finally allow resident to "outplay, outwit, outsmart" the city's hungry raccoons, who have ravaged their green bins for years. YouTube

After toppling Ford Nation, now Toronto Mayor John Tory wants to take on raccoon nation — or at least keep them out of your compost.

Waking up to eggshells on the lawn and coffee grinds on the driveway is an all-too-common occurrence for many of the 500,000 houses that use the bin. As the 13-year-old design nears the end of its life cycle, the city has designed, with the the help of engineers and animal behaviourists alike, a raccoon-proof design.

In an effort to reduce the raccoon problem, the city of Toronto desgined a new green bin which is intended to inaccessible to raccoons.[17]

May 15, 2015



TORONTO SUN MONDAY JULY 27 2015

NEWS TORONTO & GTA

Don't get caught aiding and abetting Toronto raccoons

BY DON PEAT, CITY HALL BUREAU CHIEF
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Mayor John Tory is waging war against the masked critters found across Toronto. (Brian Thompson/Postmedia Network/Files)

TORONTO - Treason is a strong word but Mayor John Tory isn't afraid to use it if a Toronto resident is intentionally helping Raccoon Nation.

Tory's tongue-in-cheek warning comes in the wake of a report to the city's licensing committee noting the biggest wildlife issue for Hogtown residents is the mess created when raccoons get into the garbage and that most of the city's wildlife problems are created by intended or unintended feeding by humans.

"Have you read Section 46 of the criminal code? Section 46 of the criminal code is the one that deals with high treason," Tory joked to the Toronto Sun on Friday.

He went on to suggest that any residents "who are feeding raccoons and harbouring them on their decks and otherwise coddling them" are aiding our adversaries.

"We may have to consider investigations under the existing laws," Tory said ahead of the Victoria Day long weekend.

The mayor has been waging a one-sided war of words with the city's raccoon population since last month when he unveiled Toronto's new raccoon-resistant green bins.

"But in the absence of (high treason charges), maybe if people just adopted some common sense and didn't feed them and didn't harbour them, the raccoons will go back where they belong which is in the ravines," Tory said — he was serious about this part.

"They'll eat mice there, which is a public service, and everybody will be happy."

Tory then went back to the Raccoon Nation rhetoric.

"In the meantime, I understand the federal authorities are looking carefully at

Mayor John Tory joking states that supporting raccoons in the city of Toronto is an act of high treason.

“[Residents] who are feeding raccoons and harbouring them on their decks and otherwise coddling them” are aiding the city's adversaries.[18]
- John Tory

Habitat Typologies of the Raccoon

Fig. 2.32.

STRUCTURE / *Den*

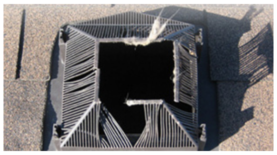
Raccoons are not picky home owners and will lay claim to any vacant cavities where they will make their dens. At any given time, a raccoon will have 2-3 dens and will move frequently between them. A mother will construct an insulated nest, the size of a frisbee, from available materials often paper, cardboard, foam and plastic. They will use a common latrine.

SITE / *Naturally occurring*

Tree cavities, abandoned burrows, and old stumps all make for ideal, naturally occurring, raccoon dens. Despite their size, they are able to enter into openings as small as 2.5 x 4 inches.

Points of entry

In the urban biome, raccoons will elect to share human habitats. They will go through extensive effort to enter into an attic, chimney, garage or shed to find shelter, damaging the property in the process.



Nesting space

Once inside the warm, protected cavity of the building, raccoons tear up and move insulation to make themselves feel at home.

Removal techniques

To remove raccoons from places in which they are not welcome, elaborate live traps can be attached to points of entry, trapping them as they leave their den. Otherwise they can be caught by hand.

Preventative measures

Wire mesh covers for every chimney, soffit and vent opening help to deter raccoons from breaking in and finding shelter.

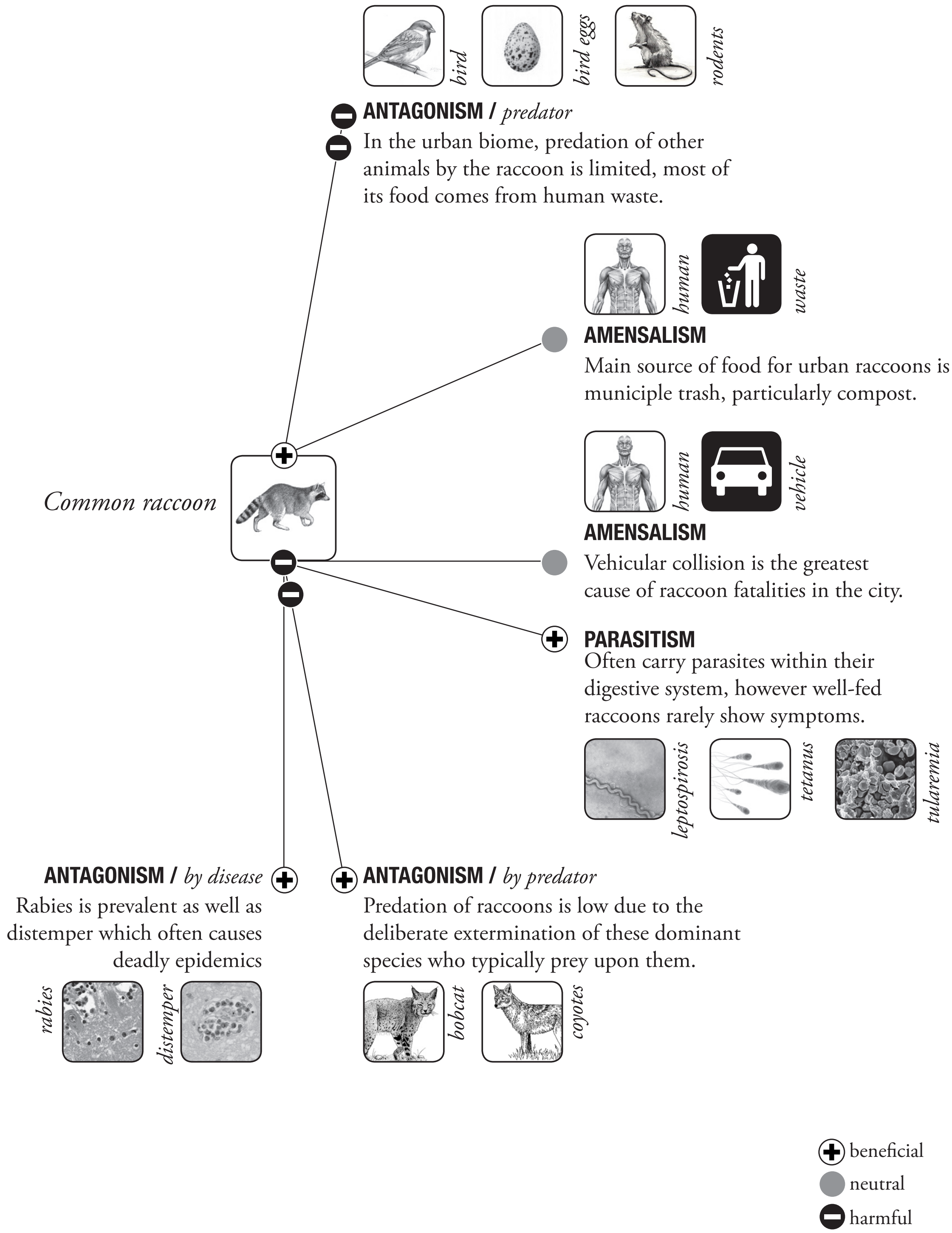
Over 2.5 million people inhabit the metropolitan area of Toronto and share their urban environment with over 100,000 raccoons.[19] Toronto's milder winters, limited snow, ravine network, and most importantly, lower density neighbourhoods, create the ideal conditions for raccoon inhabitation.[20] The resulting density of over 150 per square kilometer has earned Toronto the title of Raccoon Capital of the World as determined by the PBS show *Nature*.

Older, often slightly denser, neighbourhoods such as Danforth, Riverdale and The Beaches are home to larger populations likely due to greater volumes of garbage. Within a neighbourhood, each raccoon maintains a home range of approximately three block radius.[21] Typically natural predators define the limits an animals home range. In the case of the urban raccoon its greatest predator is the vehicle, therefore major roads serve to limit a raccoon's territory. Despite their awareness of the dangers, they still frequently fall victim to motorist. Toronto Animal Services received 6,398 calls regarding the removal of dead, sick and injured raccoons in 2013.[222]

Within a home range, a raccoon will maintain and migrate between up to 20 nests which are concealed inside tree cavities, attics, chimneys and sheds. Raccoons will traverse their home range in search of green bins to raid, lawn grubs to scavenge and garden produce to procure. At daybreak, they retire to one of their innumerable dens. The nuisance caused by these non-human, urban dwellers motivates desperate human residents to employ private removal services to trap and extricate the creature from their property. However, Toronto by-laws dictate that a raccoon can't be moved more that 1km from the point where it was found and it must be released within a 24 hour period. So for $300, an annoyed homeowner can have the raccoon relocated from their property to a neighbour's.

Biological Interactions of the Common Raccoon

Fig. 2.33.



PEREGRINE FALCON

Falco peregrinus

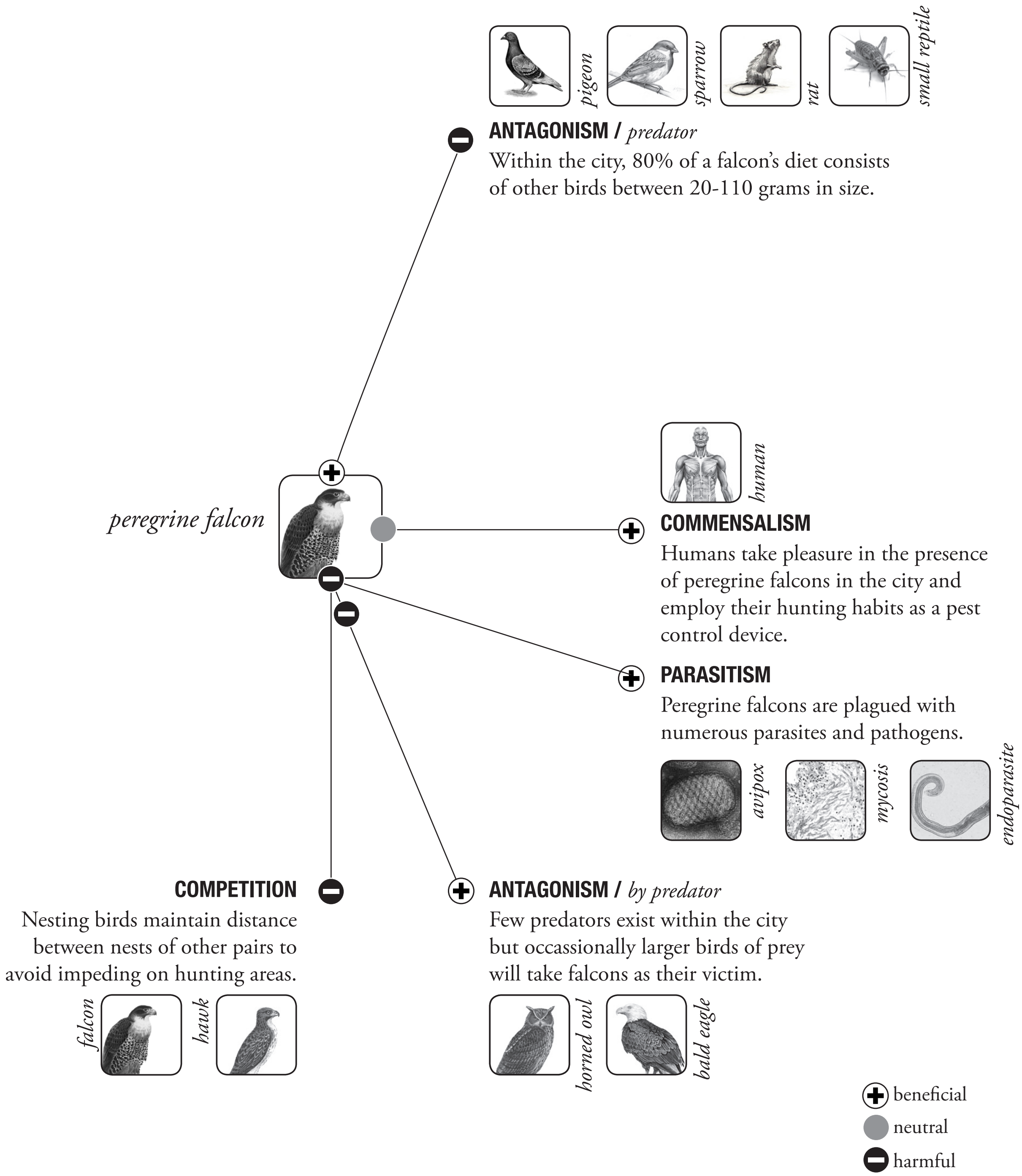
Dawn breaks and the light of the rising sun reflects off the glass of the city's towering cliffs. From one of the tallest towers, a peregrine falcon gazes down upon the happenings of the city; business people scurrying from subway to office, vehicles moving through the streets at an arduous rate and shop owners slowly preparing for the day. None of the activity registers in the acute eyes of the predator whose attention is attuned to register only the flap of small wings. A flock of pigeons is suddenly startled by the crash of a street vendor's cart and they lift swiftly up into the air. Opportunity—the peregrine presses off from his watch tower and turns downward, accelerating into a lightning fast dive. Before a juicy pigeons can respond, it is struck by a decisive blow from the peregrine's beak, knocking it to the ground. With precision the peregrine latches its sharp talons around the unconscious bird and begins forcefully defeathering the plump body. People gather around to experience the spectacle, watching with both horror and delight as the falcon tears out each feather. After feasting upon the flesh of the bird, the peregrine falcon espaces the gaze of crowding humans and flies back to the security of his gravel scrape. Meanwhile, in the background of his nest, a fascinated camera documents his every move.

Biological Interactions of the Peregrine Falcon

Fig. 2.34.

Few predatory species inhabit the urban biome. The particular food requirements, spatial necessities, and prodominance of humans makes the urban life impossible for many. Peregrine falcons however have taken to living in the city primarily due to the abundance of food. Pigeons, sparrows, and rats, all of which are prolific within the urban environment, become nourishment for peregrines.

Unlike larger predatory mammals such as bears and coyotes, peregrine falcons pose no biological threat to humans. As a result humans are widely tolerant of their presence, even encouraging co-habitation. Over the last decades since the resurgence of peregrine falcon populations in North America, human city dwellers have built nesting boxes, established video observation systems and have continued to monitor the presence of the bird. While humans sustain no direct biological gains from them, peregrine predation does help to control feral and pestilent species populations more successfully then human attempts.

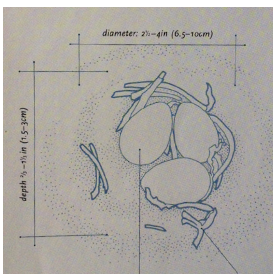

pigeon
sparrow
rat
small reptile
ANTAGONISM / predator
Within the city, 80% of a falcon's diet consists of other birds between 20-110 grams in size.
peregrine falcon
human
COMMENSALISM
Humans take pleasure in the presence of peregrine falcons in the city and employ their hunting habits as a pest control device.
PARASITISM
Peregrine falcons are plagued with numerous parasites and pathogens.
avipox
mycosis
endoparasite
COMPETITION
Nesting birds maintain distance between nests of other pairs to avoid impeding on hunting areas.
falcon
hawk
ANTAGONISM / by predator
Few predators exist within the city but occassionally larger birds of prey will take falcons as their victim.
horned owl
bald eagle
beneficial
neutral
harmful

Habitat Typologies of the Peregrine Falcon

Fig. 2.35.

STRUCTURE / *sSrape*

Peregrine falcons occupy the most minimal form of nest, a scrape, it is merely a depression in a mound of gravel. The female will move from side to side to create a imprint which has the optimal depth for temperature control. In the wild, nests are situated on high, rocky cliffs giving these predatory birds ideal perspectives from which to hunt.

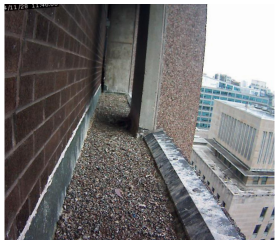


STRUCTURE /
Nesting box

Within the city, humans have taken to contructing nest boxes and affixing them to tall buildings to encourage the settlement of nesting pairs of falcons. The boxes are generally constructed of wood and filled with gravel. Ideally they are oriented south, adjacent to large open spaces for hunting and maintain significant distance from other pairs.

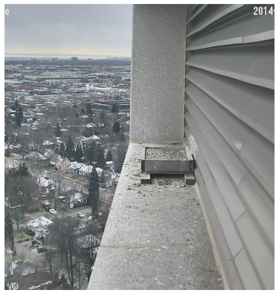
18 KING ST, TORONTO
open ledge

Nest found on an open ledge, approximately 30cm deep, and covered with roof ballast. No additional human provision of nesting space.



ETOBICOKE SUN LIFE
nesting box on ledge

A wood nesting box is placed on a concrete ledge adjacent to the vent for the mechanical space. The location overlooks a highly treed residential neighbourhood.



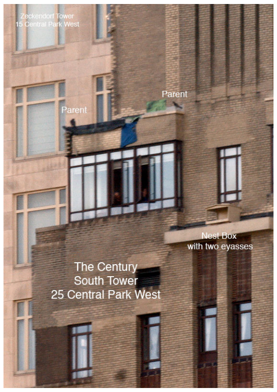
TORONTO SHERATON
nesting box on ledge

Situated on a deep ledge which obcures the mechanical level from the street, 43 storeys (approx 56m) below. Vents provide warmth. Surface is covered in gravel and debris and houses a wood nesting box. The Brutalist building was constructed in 1972 and has housed peregrine falcon pairs since the late 1990's.

CENTURY TOWER, NYC

nesting box below window

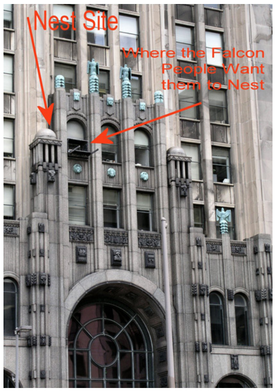
A 1931 Art Deco apartment building located adjacent to central park is the frequent home for falcon pairs. Architectural detailing provides a suitable ledge for a nesting box located on the south facing side and as well as ideal perches for preying on Central Park pigeons.



FISHER BUILDING

detailing above door

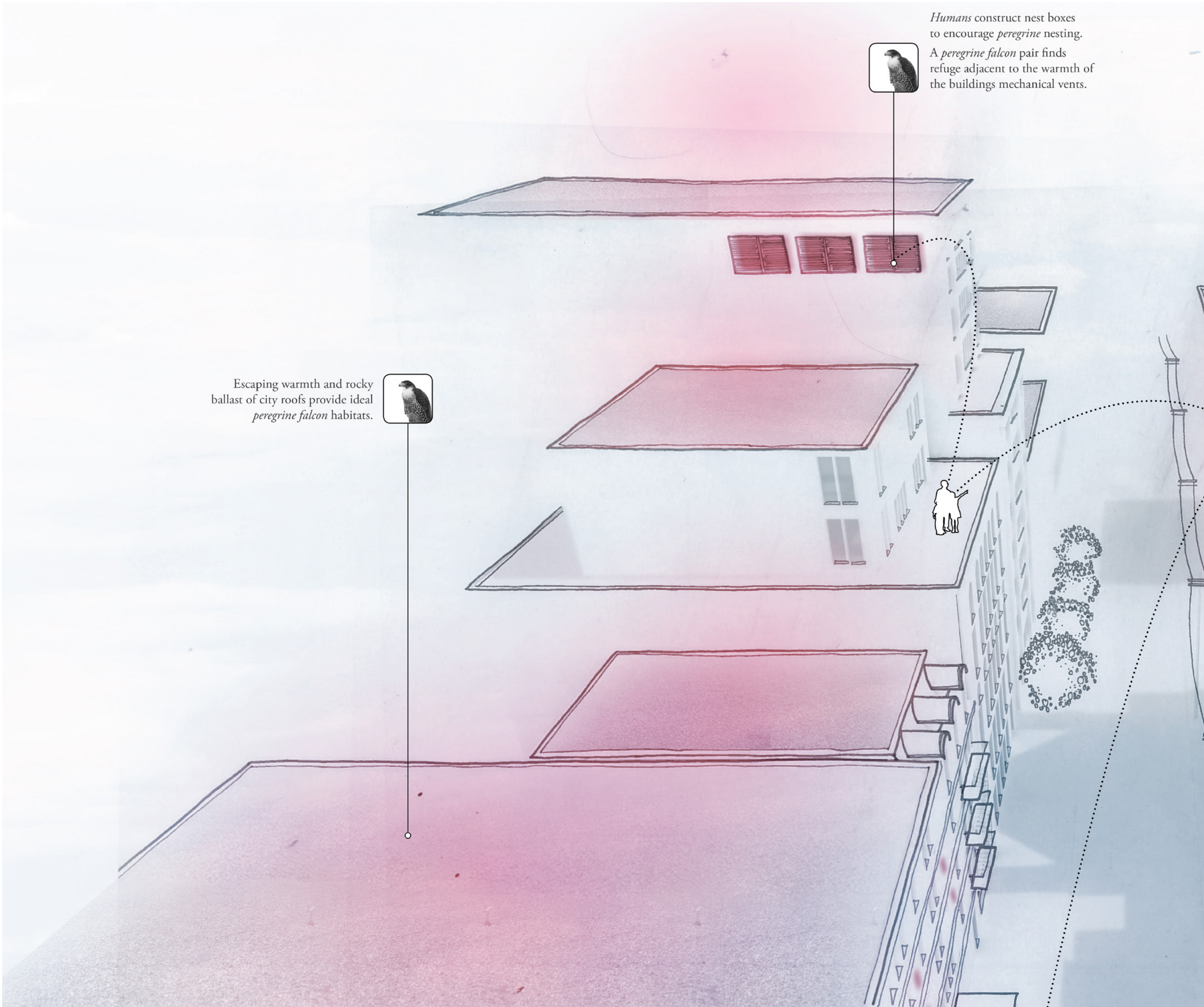
The Fisher building is a landmark skyscraper built in 1928 in the Art Deco style. Falcons have taken to nesting in the ornate detailing above a doorway despite the fact that a nesting box has been constructed for them in a different location.



NORWICH CATHEDRAL

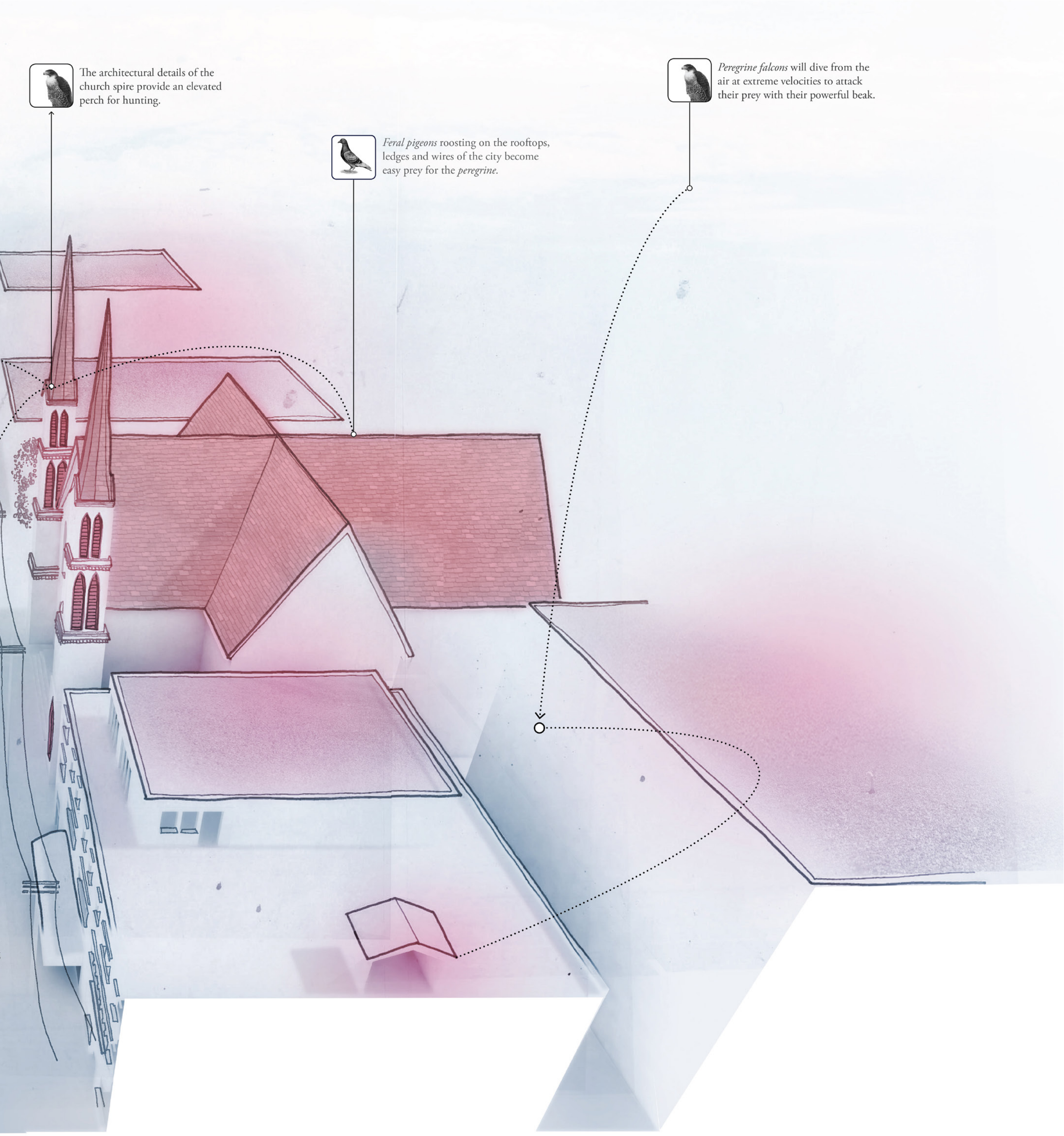
nesting box on spire

Nesting box affixed to window vent on the spire, 76m above the street.



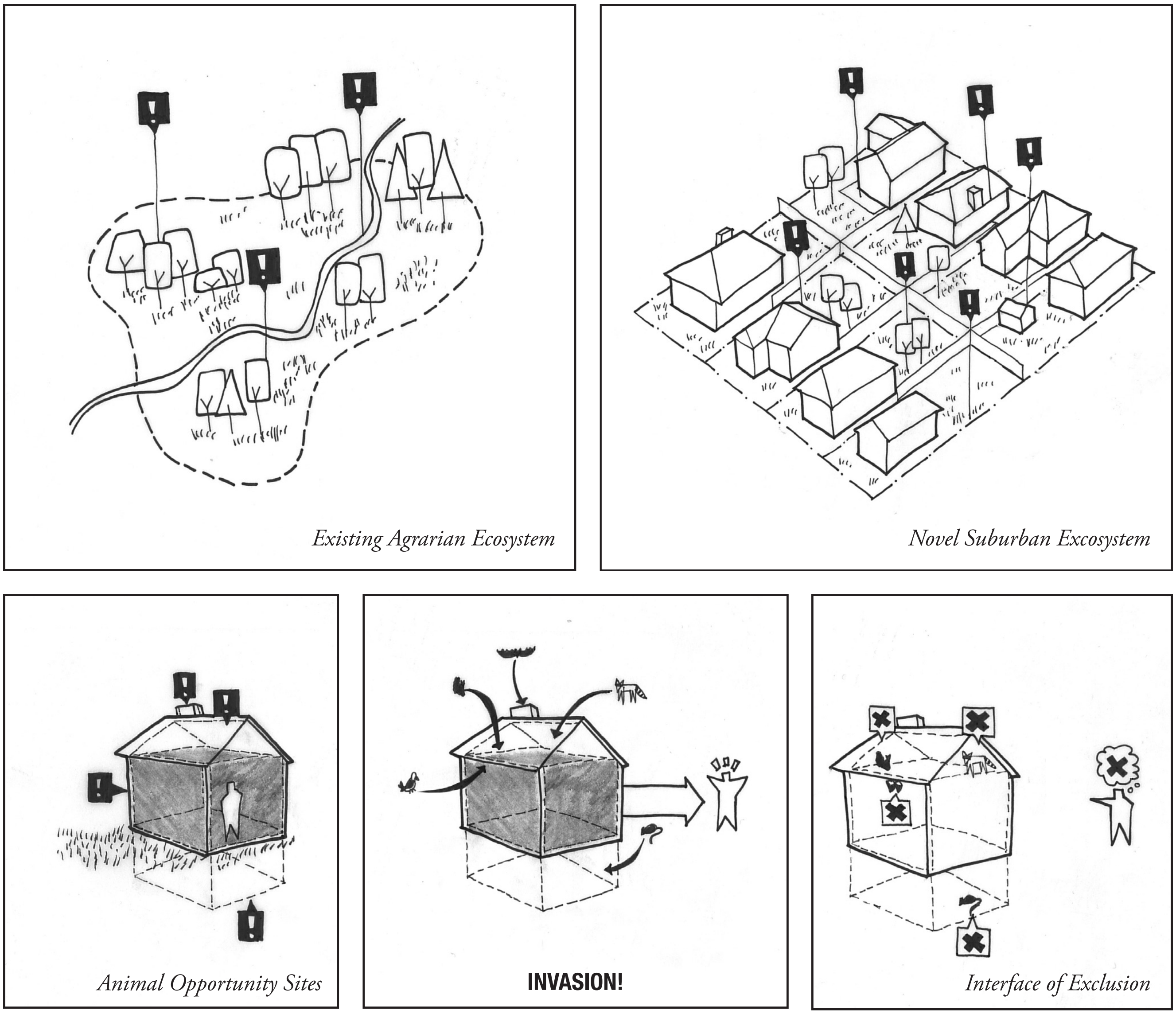
The Peregrine falcon soars above the city, looking down upon the streets and rooftops below. The heat radiating from mechanical vents and ballast covered roofs are perceived as viable sites on which to build its scrape nest. The bird of prey watches from its elevated perch on roof parapets and church steeples for the sight of flapping pigeon wings, at which point it will swoop down to catch its prey.

Fig. 2.36. Peregrine Falcon Umwelt Section through Urban Biome


The architectural details of the church spire provide an elevated perch for hunting.
Feral pigeons roosting on the rooftops, ledges and wires of the city become easy prey for the *peregrine*.
Peregrine falcons will dive from the air at extreme velocities to attack their prey with their powerful beak.

part three

BETWEEN SUBJECTS



INTERFACE & EXCLUSION

Fig. 3.1. Narrative of Suburban Development and Cohabitation

Existing agrarian landscapes are gradually parcelled off and sold to eager developers. The land is rapidly transformed into novel suburban ecosystems. The prototypical single-family homes present a plethora of opportunities for animal invasion. The typical interface between human and animal structures a condition of exclusion - once animals move in, humans move out.

Animal Subjectivity

Animals have been present throughout human history as allegorical representations, cultural icons, and sacred symbols. Human existence is entangled with animals as a source of food, production, identity, and companionship and as a result, humanity has always grappled with the division between human and animal.

Over the last 100 years, researchers have been examining the question of animal consciousness to further understand human animal relations. During the late 1800's, the field of zoogeography emerged to examine the mutual influence between animals and their environment. The research conducted established the first form of the animal geography discipline and focused specifically on wild species. By the mid 20th century, animal geographers shifted their focus towards the impacts of humans on animals and the processes of domestication. Carl Sauer and Charles Bennett were key figures in redefining animal geography as cultural ecology, the study of human adaptations to social and physical environments. They studied how traditional pastoral animal practices and subsistence hunting and fishing shaped human societies and their occupation of a landscape. Through the 1980s and 90s, animal-advocacy emerged as a global issue exposing the mistreatment of animals. This ultimately expanded the discipline of animal geography for a second time to include all encounters between human and animal. The discipline argued for the abandonment of the human subject / animal object paradigm in favour of posthuman ideas of animal subjectivity.

In a posthuman society, the animal is no longer an object to which actions or feelings are directed. The animal is now a subject alongside the human subject, capable of possessing consciousness of experience, perspective, and agency. Once the division between human and animal is abandoned, what happens between subjects? The art of Dadaist Hannah Hoch and contemporary artist Patricia Piccinini interrogate the absence of boundaries and create conditions of human animal hybridization. During the mid-20th century, Hoch utilized collage to splice together animal and

Fig. 3.2. Hannah Hoch, *Flucht* (1931).

Fig. 3.3. Patricia Piccinini, *The Carrier* (2012).

human forms. Piccinini goes further to integrate animal characteristics into life-sized sculptures of realistic, pseudo-human figures. For her piece, *The Carrier,* Piccinini constructed a man with gorilla-like proportions, sharp talon toenails, and a snout-like nose. The figure is bent forward, burdened under the weight of a poised elderly woman that it carries on its back. It presents a condition of human dependency but also companionship with hybrid human animal subjects.

Both artists manipulate the boundary between what is human and what is animal in attempts to come to know the *other* and to find new synthetic relationships between subjects. For Jennifer Wolch, the question of knowing the other is crucial to engaging the animal as a subject. "People should come to know, however partially, the animals with whom they coexist, thereby sustaining webs of connection and an ethic of respect and mutuality, caring and friendship."[1] Only then can the animal transition from foreign object into an active subject.

However, the thesis acknowledges that, in order to convert the passive animal object into an active subject, the differences between diverse states of being must be defined. Latour states, "[w]e cannot simply bring objects and subjects together, since the division between Nature and Society is not made in such a way that we can get beyond it. We have to consider that the collective is made up of humans and non-humans capable of being seated as citizens, provided that we proceed to the apportionment of capabilities."[2] To position animals as citizens requires the integration of their biological needs and socio-cultural desires with the needs and desires of all other subjects. Together the multiplicity of subjects and associated needs and desire can inform the design of the shared environment.

However between human and non-human subjects certain proximities and interactions are not tolerable. Designing the *physical limits* or *interface* between human and non-human is therefore critical to establishing the required spatial definition between distinct entities and allow for cohabitation between heterogeneous subjects.

Interface and Invasion

An *interface* is defined as a point where two or more systems, subjects, or organizations meet and interact. Architectural forms–walls, windows, roofs, and ornamental details–form the interface between human and animal subjects. These architectonic elements define conditions of interiority and exteriority, dividing climatic zones, territories, and inhabitable spaces. The materiality of an interface can enable or restrict how subjects interact. Architecture as an abiotic form can therefore support, enhance, or limit ecological relationships between biotic actors. Joyce Hwang argues that, "[w]e must consider the wall not only as a façade, but more significantly as potentially inhabitable membrane that can sponsor the propagation of living organisms."[3] The fundamental elements of architecture therefore take new meaning beyond aesthetic, structural, and atmospheric devices. They are productive interfaces which delineate *synanthropic space* and have the potential to establish new ecological and cultural relationships between subjects.

def'n . synanthropic space
physical space of shared interaction between human and synanthropic animal

A synanthropic interface inevitably invites opportunistic species to invade. Designing building enclosures with inhabitable volumes (walls, windows, roofs, ornamental details); with potential for vegetal propagation (green walls, mushroom cultivation, moss surfaces); or that establish movement continuities (animal crossing, wildlife corridors); allow animals to enter and inhabit human territory. To deliberately invite undomesticated animals to live alongside humans contradicts the long standing separation of human and nature. Society is conditioned to defend against invasion, to protect the domestic realm from unwelcome animal intrusion.

To instead consider the non-human as an equal citizen, the thesis reasseses the negative connotations of invasion and infestation. Joyce Hwang writes in *Living Among Pests,* that in order to enable the possibility of invasion, designers must not only incorporate diverse habitats into the built environment, but also, "unshackle architecture from the time-based assumptions and cultural biases," in order to provoke new priorities.[4] If conceptual limits, which define domestic territories, become porous and malleable, human priorities could be realigned to value conditions of invasion and infestation instead of fearing them.

Multiple Scales

At first, the question of the interface may appear narrow; minor in scale and magnitude, however the objective is to contemplate the impact of small scale, architectural interventions on the larger environment. Ecology operates at multiple scales, encompassing interactions between microbes, organisms and abiotic elements. In contains complex networks and systems which are interconnected across local, territorial and global scales. The design of human environments also occurs across a range of scales from small architectural details to inhabitable built forms, to landscape patterns and urban systems, and finally to territorial operation and transformations. The disciplinary boundaries between architecture, landscape architecture, and urbanism that once governed scales of practice are increasingly blurred.

Despite increasingly multi-disciplinary and multi-scalar design practices, there remains limited understanding of how interventions at one scale ecologically and spatially impact another. Ecologists, on the other hand, continue to explore the interrelationship between species and their subsequent effect on the habitat surrounding them. However the correlations between ecological action and reaction are not always clear. Take for example

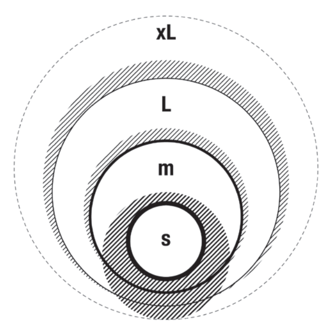


Fig. 3.4. Multiple Scales diagram

the highly referenced story of the reintroduction of wolves into Yellowstone National Park. By reintruding the animals, ecologists reversed the top-down trophic cascade that occurred when the apex predator had been eliminated from the park by humans several decades before. The return of wolves was believed to have brought the overabundant elk population under control, enabling the young willow tree population to fortify and thereby stabilizing the banks of the river.[5] However, field biologist Arthur Middleton contests that, based on continuing research, there is little correlation between the return of wolves into Yellowstone and the fortification of willow tree populations, arguing that innumerable other factors contribute to changes in the ecosystem.[6] Any intervention into an ecosystem is confronted by a complex network of relationships between species, across landscapes, and with environmental systems, that are still not completely understood by ecologists, let alone architects and urbanists.

For design practitioners, the ecological implications of design choices and built interventions are even less clear. A building's impact on the ecology of its surroundings is rarely studied beyond its effects on wind velocity and shadows. Larger scale landscape projects also typically engage environmental system issues such as water management, solar orientation, and seasonal patterns however they tend to overlook the animal species who also inhabt them. Projects which deliberately attempt to incorporate animal behaviours and interactions into largescale projects, such as Downsview Park, often remain speculative and therefore the viability of the proposal canot be tested. However, scenarios are emerging where unintentional designs of the built environment have had positive ecological impact. The synurbization of peregrine falcons is a prime example. The birds of prey have unexpectedly taken up residency on towers and tall bridges in the downtown core of cities throughout North America. The opportunities created certain tower designs have unintentionally fostered a revival in peregrine falcon populations.

Drawing inspiration from these indirect outcomes, Michael Rosenzweig makes an arguement that human structures have the ability to reconcile relationships with non-human species if they are deliberately designed for cohabitation. In his book *Win-Win Ecology,* he makes a case using the narrative of decline and eventual return of Eastern bluebird in North America. The practice of removing dead trees and branches from landscapes reduced available habitats for bluebirds and other cavity dwelling species. In an effort to adapt, bluebirds began occupying wood fence posts until, those were increasingly replaced with aluminium fencing options. The combination of limited available nesting sites with high competition from foreign sparrows and starlings catalyzed the decline of Eastern bluebird populations. Each modification of the environment accumulated to have negative effects on the livelihood of the bluebird. Bird advocates noticed the decline in populations and began developing specifically designed bluebird nest boxes in an effort support the at risk species. The nest box design, which has been made widely available, provides adequate nesting space, reduces competition from sparrows and starlings through the size of the openings, and protects bluebirds from nest predation. The implementation of the boxes takes into account the habitat requirements and territorial restrictions of the bird. Designing for the eastern bluebird has fortified the species populations throughout most of Ontario. Rosenzweig utilizes the recovery of the bluebird to make a case for the potential of reconciliation ecology.

Synanthropic Suburbia is interested in the idea that animal-specific design can influence species interactions and population dynamics. According to Richard Forman, the successful design of viable habitats requires consideration of multiple scales, and in both directions, between fine and coarse . "Only by recognizing and addressing landscape changes across different scales (perhaps at least three) can planners and designers maximize protection of biodiversity and natural processes."[7] Therefore, this thesis investigates how small scale design decisions, when aggregated at the community scale, and implemented within a territory, can productively impact ecosystems and the human and non-human subjects within them.

Animal Agency

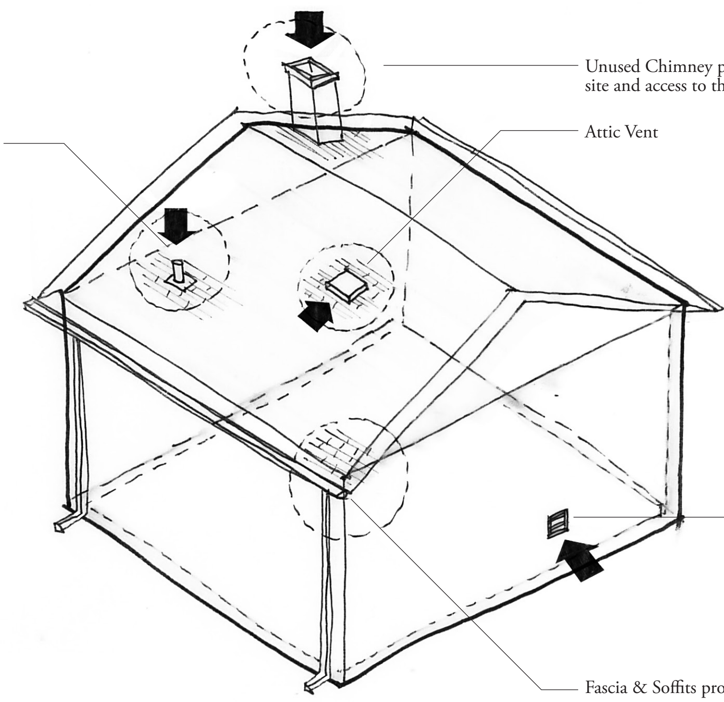
Various states of invasion have already occurred in the urban environments which humans have come to tolerate, to a degree. Torontonians have resigned to living with the infamous raccoons who plague the city, despite the nuisance caused by their nightly scavenging. The pigeons who invade public spaces in cities around the world have been begrudgingly accepted as a perpetual presence in the urban environment. Occasionally humans assert themselves against invasion; attempting to claim back territory by raccoon-proofing green bins or installing electrified pigeon deterrents. However, any efforts to prevent invasion and completely eradicate synurbized species is futile.

Instead, society must relinquish its negative associations with invading urban animals. These synanthropic species constitute the "wildlife" of the city and have the capacity to enrich the urban environment. They are the animals which urban citizens encounter most frequently, yet, they continue to be perceived as antagonistic objects, trapped within the subject / object paradigm. However, if given subjectivity, synanthropic animals could have agency as environmental actors. What if their actions and behaviours were structured to generate productive outcomes for humans and the environment? Society could then perceive the synanthrope differently. What if pigeons were leveraged as biotic drones? With cameras and tracking systems affixed to them, they could map the city from a multitude of perspectives and piece together a world that is between street view and aerial perspective. The sight of a flock of drone pigeons would then resonate for humans as a new source of information about the city. Or what if rats were employed to monitor subterranean infrastructures? Each rat could be equipped with GPS to follow their movement through subway systems, storm water drains, sewer infrastructures, and building foundations to identify weaknesses and cracks in the hidden infrastructures that support the city. Hybrid techno-natures could redefine the relationship between urban animal and human.

The thesis seeks to engage the behaviors and patterns of non-humans through the design of interfaces with the objective of expanding the allowable space of the synanthrope and reducing the boundary of human territory. It speculates that living alongside synanthropic animals could become desirable, not just inevitable. A state of mutualism could emerge in which humans also benefit from living in close proximity to animals who remain beyond their control. Humans could become *synanimalic*, perceiving that what is good for animals is good for humans.

def'n . synanimalic
living alongside, benefiting from cohabitation with animals

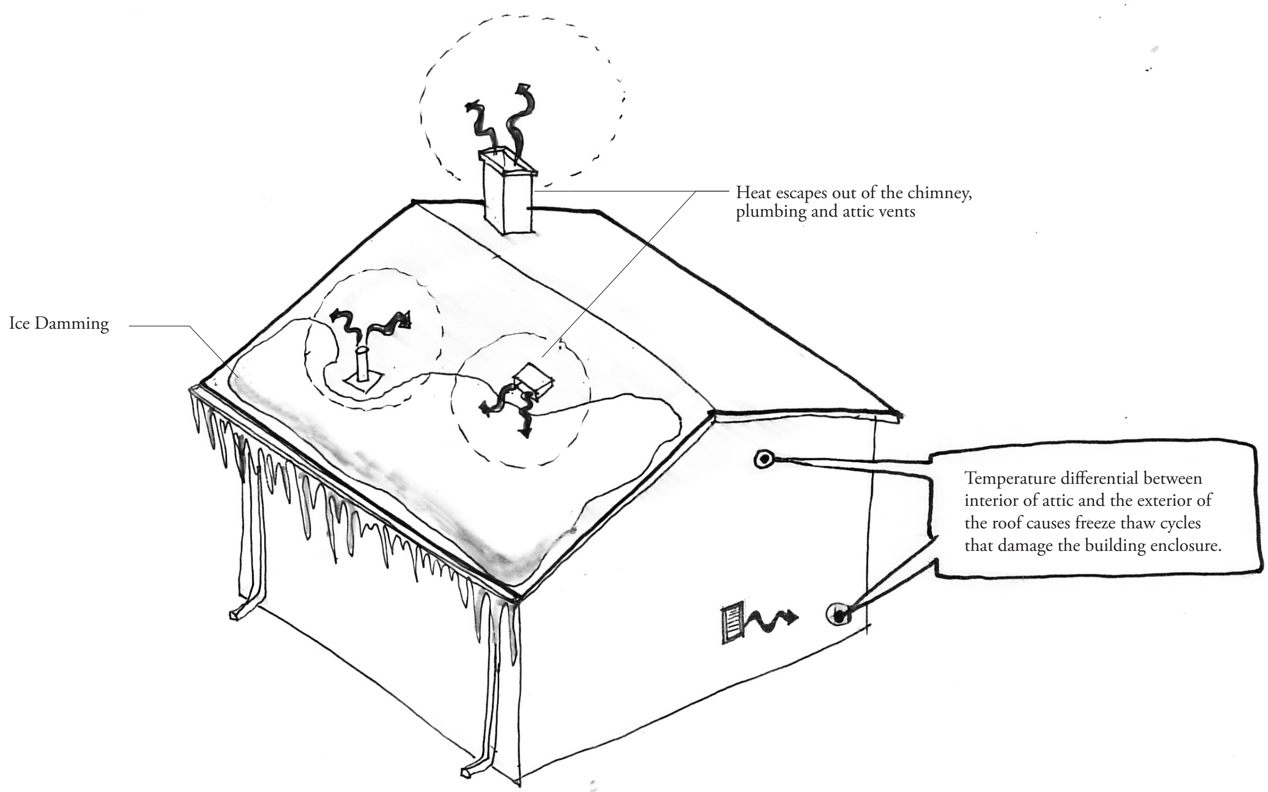
In the future, once the synanthropic animal is embraced as a contributing member of society, humanity would welcome new actors into the city. Species who have yet to adapt to the rapid transformation of the urban environment would be encouraged to take up residency. Humans would facilitate the synurbization process by identifying ecological opportunities and subsidizing habitat and food requirements. Citizens would be stewards of the urban environment responsible for encouraging species diversity and ecological operation of the biome.



INTERFACE OPPORTUNITIES

Fig. 3.5.

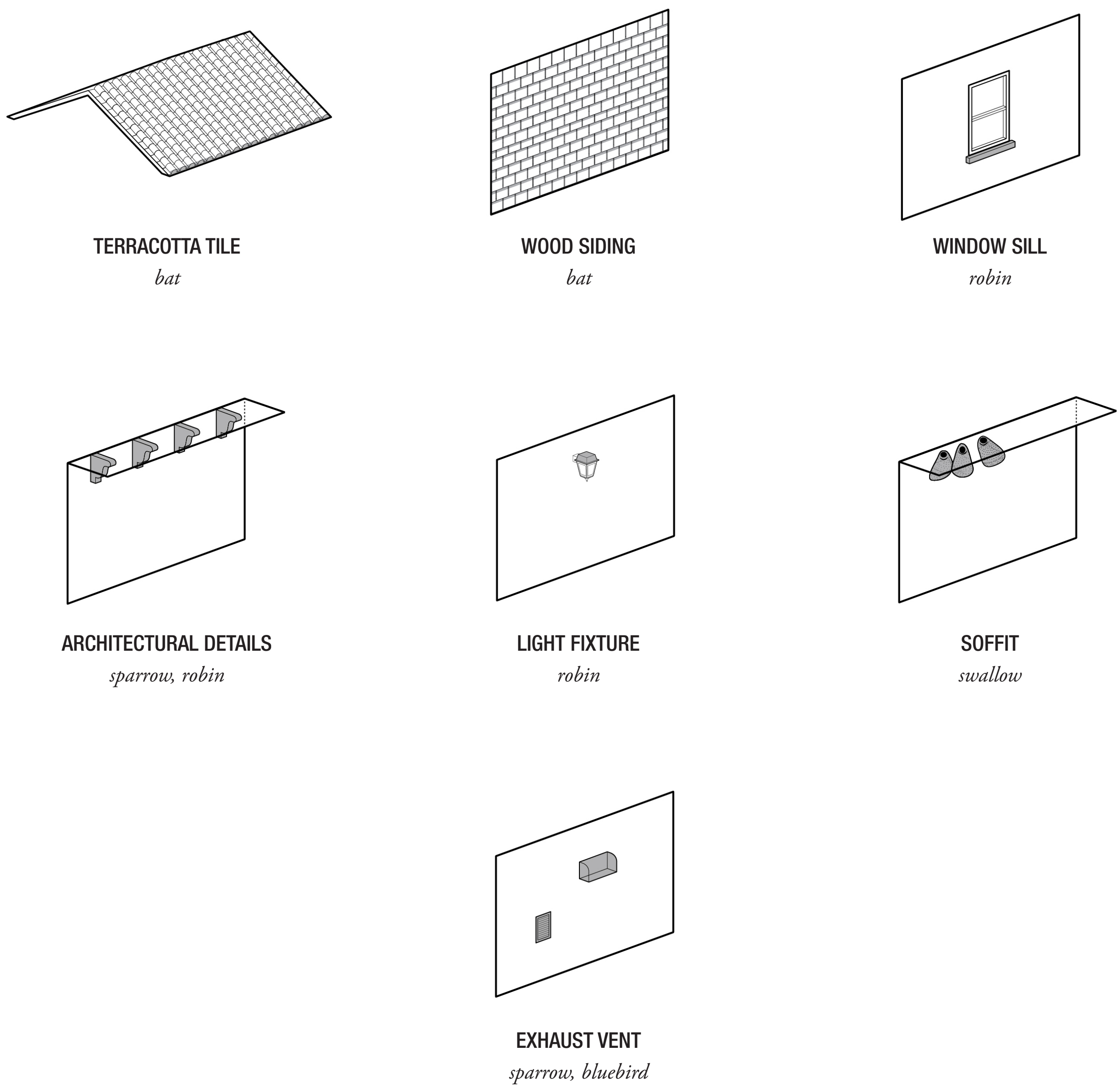
The building enclosure of the single-family house defines an interface between human and animal. Its walls, roof, climatic control systems, exterior surfaces, and inner cavities present a diverse array of opportunities of synanthropic animals. Attic vents, porch lights, and plumbing exhausts provide warm nest sites for birds and entry points for mammals. Weaknesses along soffits and at the edge of eaves give dexterous mammals easy access to interior spaces. Chimneys and insulated attics are ideal wintering habitats and breeding sites for squirrels and raccoons. Even wall cavities and floor spaces are opportunities for the smallest synanthropes, rats and mice.



INTERFACE VULNERABILITIES

Fig. 3.6.

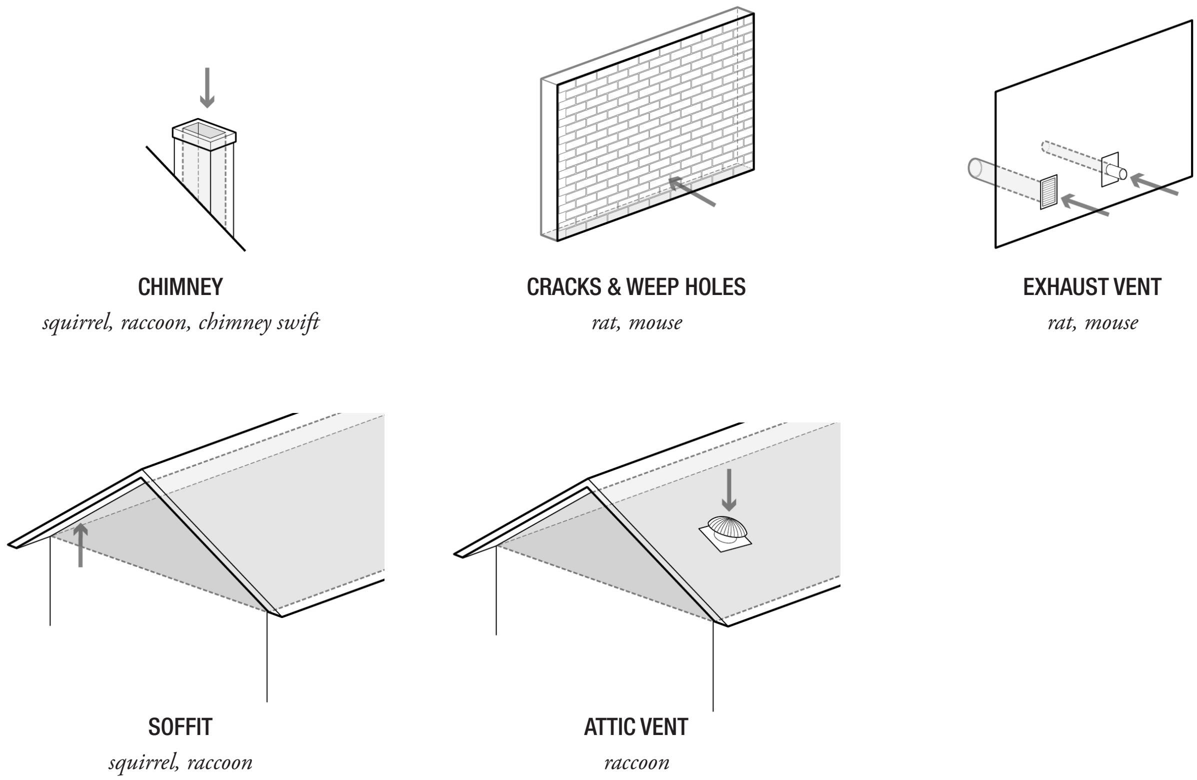
For humans, the boundary of the house delineates the domestic realm, a space which is perceived as distinct from nature. Any space through which a synanthropic animal can penetrate or inhabit the enclosure of the house is considered a vulnerability. Mechanical devices such as vents, exhausts, and chimneys, which are critical for sustaining the environmental conditions within the house, are susceptible to invasion. Water mitigation systems such as downspouts, roof shingles and eaves troughs, which defend the house against the elements, are also weak points in the enclosure. Humans attempt to protect the boundary of the house by places covers, grates, and deterrents at locations where animals can penetrate.



SURFACE INTERFACE

Fig. 3.7.

Migratory species who overwinter in warmer climates tend to occupy surfaces at the perimeter of the house. For example various species of birds and bats will find shelter under soffits, on ledges, in vents, and even beneath cladding.



VOLUMETRIC INTERFACE

Fig. 3.8.

Rodents, some birds, and larger mammals who require warm, sheltered spaces to survived the winter, will seek out volumetric interfaces. Any vulnerabilities in the building enclosure provide these species with points of entry into heated attic spaces and wall cavities beyond.

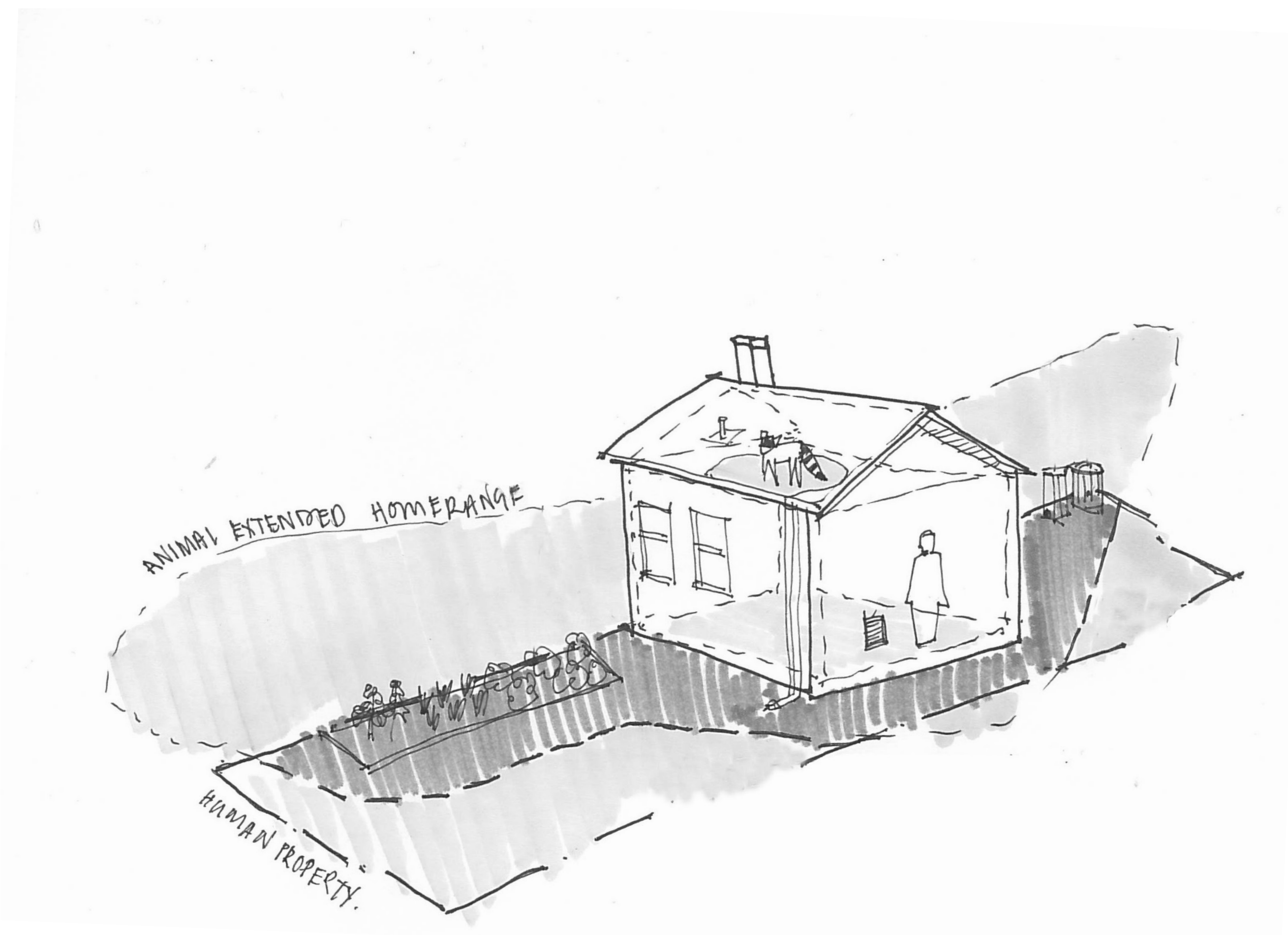
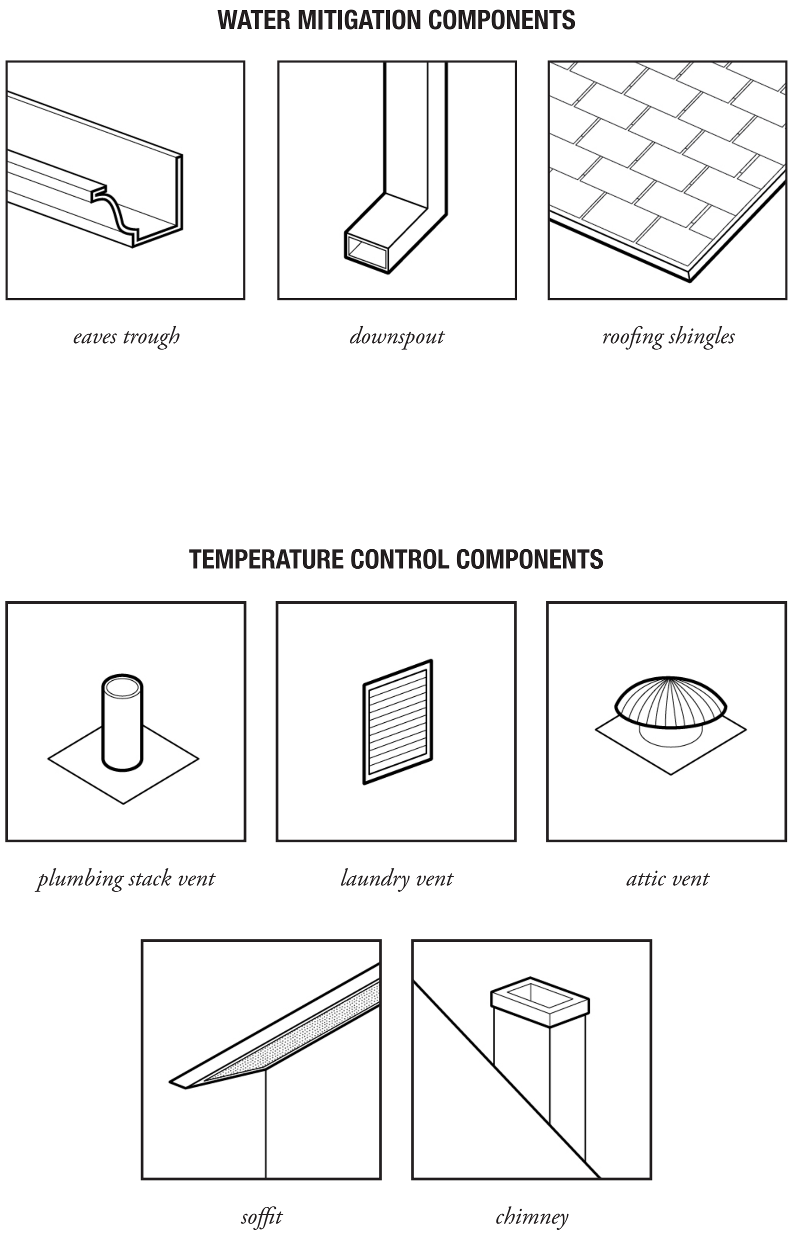


Fig. 3.9. Intersecting Human & Animal Territories.

DESIGN OBJECTIVES

Synanthropic Suburbia explores, through a series of design speculations, how the application and multiplication of small scale, architectural interventions can impact community assemblages and territorial patterns. The objective is to reconceptualize conventional building components and suburban development patterns to develop synanthropic interfaces between human and animal.

A series of architectural scale *synanthropic prosthetics* are designed to invite animals to adapt to the suburban biome and inhabit the periphery of the domestic realm. The prosthetics engage animals within systems of production, protection, cultivation and entertainment, in order to reframe synanthropes as active citizens. Ultimately, the design speculations seek to shift the conceptual limits of human territory to enable animal cohabitation within the suburban biome.



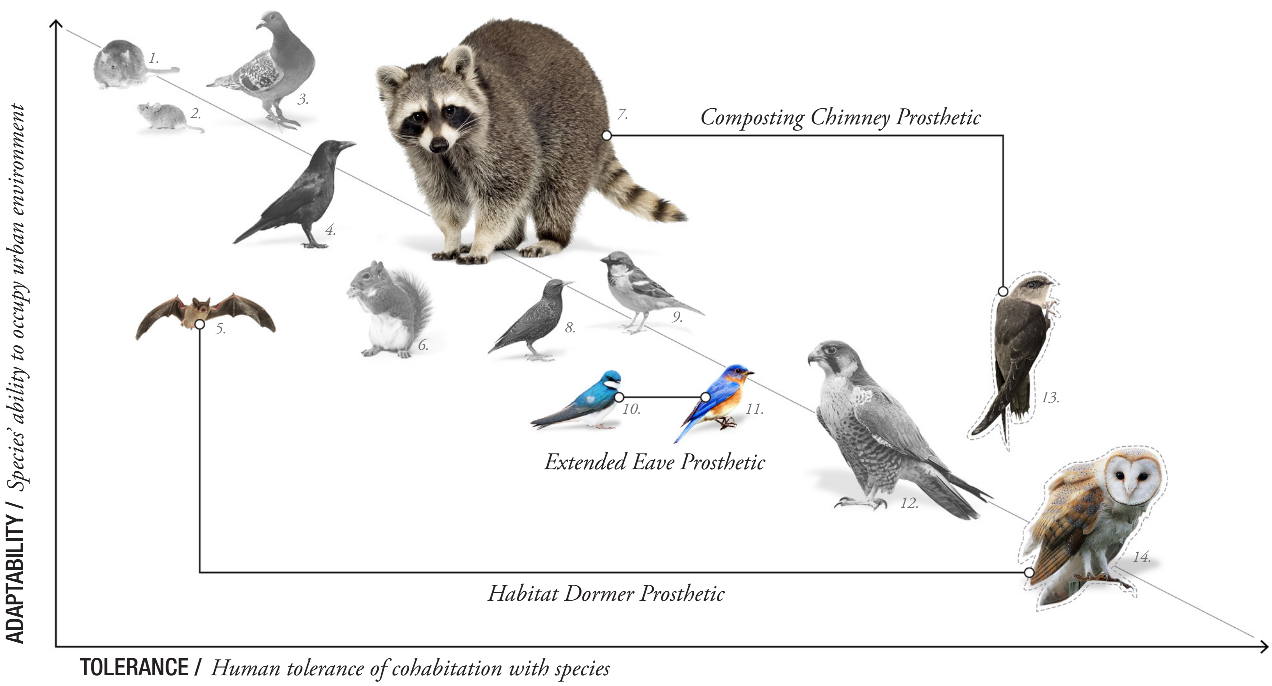
TYPICAL SYSTEM COMPONENTS

Fig. 3.10.

SYNANTHROPIC PROSTHETICS

Conventional water mitigation and temperature control components are critical to the successful operation of a building enclosure. However, the design of drainage systems, exhaust vents, and roof enclosures is mostly an afterthought, especially within typical suburban house construction. The components are generally off the shelf systems which are attached as prosthetics to the house and are often detrimental to the aesthetic value of the house.

The thesis reimagines these banal system components as mediums through which to create ecological opportunities as well as reconsider the conventional architectural language of the suburbs. The design speculations hybridize different systems into three novel prosthetics that attach to the prototypical single family house and subtly, but strategically, intervene in its function and appearance. The idea of the suburban house—the vaguely traditional forms, physical autonomy and surrounding landscape—is heavily engrained into North American culture. The design of the prosthetics acknowledges these cultural ideals of the American Dream. Radicalizing the formal language of the house through the prosthetics *and* simultaneously integrating ideas of animal occupation would challenge cultural expectations in a manor that could prove unpalatable for a majority of homeowners. Instead, each prosthetic leverages identifiable suburban forms and materials—specifically the masonry chimney, roof gutter, and dormer—to imagine systems that facilitate cohabitation with non-human species and cultivate robust ecosystems within the suburbs. The objective is to gradually shift perceptions towards cohabitation with non-humans and emphasize the need for ecological thinking in design practices. Overtime a new American Dream could emerge that prioritizes the quality of the shared ecosystem over the desires of individual homeowner.



1. Rat / Rattus norvegicus
2. Mouse / Mus
3. Pigeon / Columba livia
4. Crow / Corvus
5. Brown Bat / Myotis lucifugus
6. Grey Squirrel / Sciurus carolinensis
7. Raccoon / Procyon lotor
8. European Starling / Sturnus vulgaris
9. House Sparrow / Passer domesticus
10. Tree Swallow / Tachycineta bicolor
11. Eastern Bluebird / Sialia sialis
12. Peregrine Falcon / Falco peregrinus
*13. Chimney Swift / Chaetura pelagica**
*14. Barn Owl / Tyto alba**
** Previously adapted to urban environment*

CHART OF SPECIES ADAPTABILITY & HUMAN TOLERANCE

Fig. 3.11.

The graph maps an inversely proportional relationship between a species' ability to adapt to the urban environment and human tolerance of cohabitation with that species. The rat for example is the most highly adapted to city living and its subsequent close proximity to humans is widely intolerable. The peregrine falcon, in contrast, is slowly adapting to the urban ecosystem after significant rural population declines. Humans are beyond tolerant of peregrine falcons, often even encouraging cohabitation through the installation of nest boxes on city towers.

SYNANTHROPIC SUBJECTS

The three synanthropic prosthetics, the *Compost Chimney, Exteneded Eave,* and *Habitat Dormer*, are each designed to engage the animal as a critical actor within the system. Six species have been selected from a range of animals who were either previously adapted synanthropes, are currently synanthropic or, have the potential to synurbize. Each prosthetic integrates the characteristics, behaviours, and habitat requirements of the selected species into the form and operation of each prosthetic. Though the device targets a pair of species, it understands that the ecological opportunities created could support a wide diversity of animals, therefore inhabitation by any non-human species is considered a success.

The *Compost Chimney* prosthetic engages a more problematic species, the Common raccoon. This medium sized, nocturnal creature is notorious for using its ingenuity and dexterous paws to gain access into garbage and green bins from which it can feast upon a bounty of leftover food. The night disturbances and unsightly mess that raccoons leave behind is a nuisance for any homeowner. In the city of Toronto, the raccoon is an inevitable neighbour. Instead of lamenting their abilities, the Compost Chimney prosthetic seeks to productively employ them.

Chimney swifts are unique birds whose sporadic flight patterns and inability to perch differentiate it from other species. Historically, the cigar shaped birds have found refuge in masonry chimneys where they attach their twig nests to the interior walls using saliva. However, with the transition towards electric heating and eventually, gas fireplaces, the chimney is no longer a fixture of suburban houses. The subsequent lack of available cavities has led to a decline in population. Chimney swifts, who typically suffer nest predation by raccoons, can find safe habitat in the upper volume of the chimney. The *Compost Chimney* therefore restructures antagonistic relationships between human and anima into a mutually beneficiary systems.

The *Extended Eave* prosthetic pairs the Eastern bluebird with the Tree swallow. Through a series of misconceptions, the Eastern bluebird was and continues to be perceived as an at risk species despite its now stable populations. House sparrows and European starlings often outcompete Eastern bluebirds for use of nest cavities, and were believed to pose a threat to their population. Over the last few decades, bird advocates have formed numerous societies for the promotion and protection of Eastern bluebirds. Avid birdwatchers and gardeners have installed specifically constructed nest boxes to provide habitat for this cavity dwelling species. However the efforts are not purely based on a selfless desire to conserve the species. Eastern bluebirds are also valued for their aesthetic appearance and as a provider of an ecological service. The small bird is a voracious consumer of insects and therefore, provides a form of biological pest control.

Tree swallows share numerous qualities with the bluebird and often elect to occupy the same bird boxes. The greatest difference between the two species is that tree swallows are not culturally perceived as "of concern" when in reality they are at far greater risk than their counterpart. As a result bluebird advocates often destroy tree swallow nests if they are discovered in bluebird designated boxes, further hindering the population of tree swallows. Both species are highly territorial and defend their respective home ranges from others of their kind. The *Extended Eave* prosthetic engages these intra/interspecies dynamics in order to provide viable habitat for both species.

The *Habitat Dormer* prosthetic strives to reintegrate a previously synanthropic species, the barn owl, who previously shared a mutually beneficial relationship with farmers. The open rafters of barns previously provided nesting habitat for Barn owls and in exchange, they consumed and controlled abundant rodent populations. With changes in agrarian practices, rodenticide replaced owls as the predominant form of pest control and as a result, barn owl populations have declined. Within a suburban context, barn owls have the potential to serve the same ecological service if they are provided with adequate nesting sites, access to open space and subdued noise and lighting conditions to enable night hunting

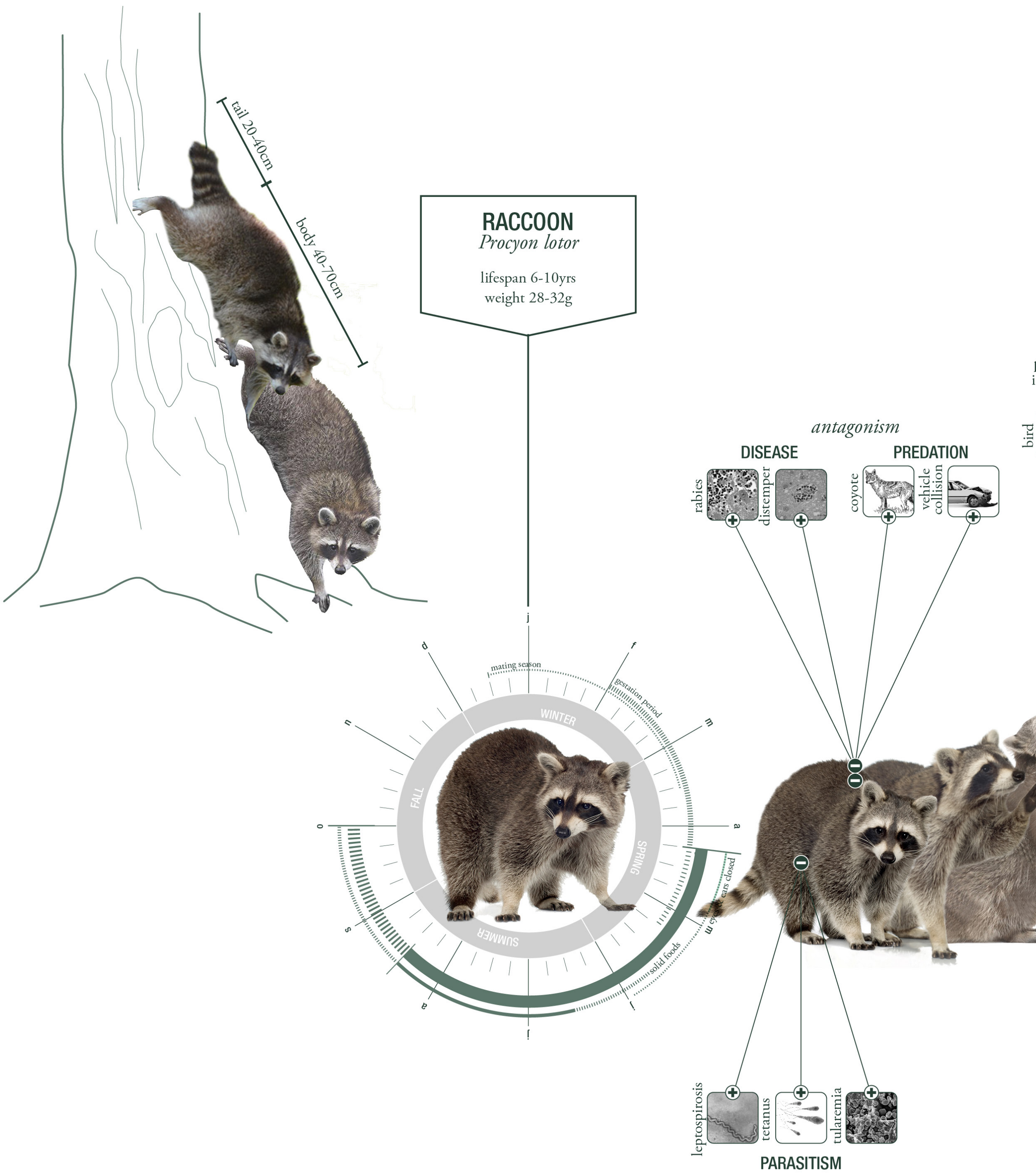
Brown bats are the most common bat in Canada however, due to white-nose syndrome, a disease found in damp caves, their populations are declining. Previously, bats could find shelter in drafty barns and attics or beneath cladding materials. However, as building enclosures become more sealed-off, they no longer provide as many habitat opportunities for animals. Despite negative cultural perception, bats make for beneficial neighbours as the bat's diet is composed entirely of insects, predominately mosquitos. Therefore the *Habitat Dormer* accommodates two distinct species who each provide pest control services but have opposing cultural perceptions surrounding them.

architectural-scale intervention

SYNANTHROPIC PROSTHETICS

COMMON RACCOON

Fig. 3.12. Species Parameters

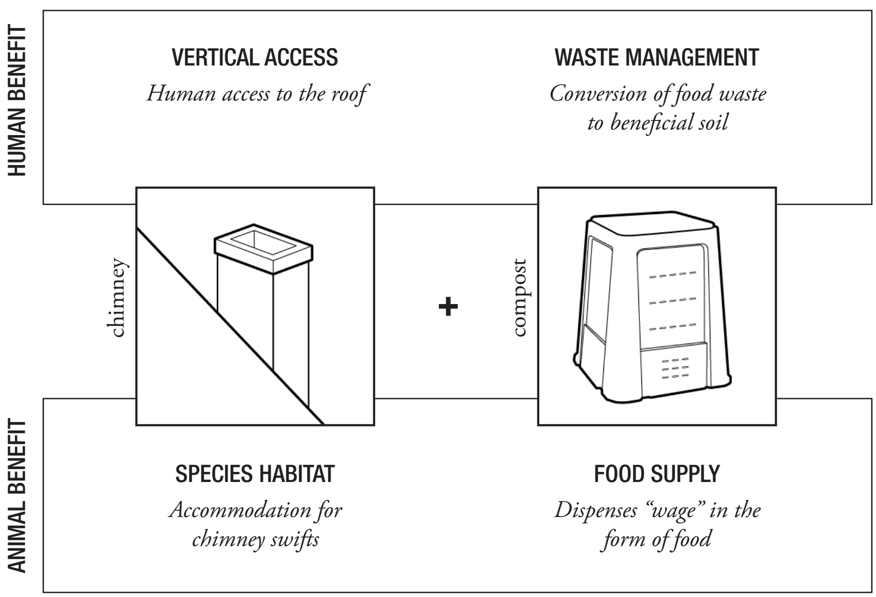



MIDNIGHT
9PM
HUNTING
predation by raccoons is limited
in the urban biome since there is
an abundance of human waste
bird eggs
rodents
HOMEOWNER
REFUSE FOOD
fruit
poultry
grains
height
shoulder 23-30cm

COMPOST CHIMNEY PROSTHETIC

Fig. 3.13.

The popularity of the gas fireplace has rendered the conventional domestic chimney obsolete. The form of the chimney is re-appropriated through the design process into a permanent compost system. Food waste is inserted into the base where it undergoes a three stage process. The digestion and circulation stage is executed by the raccoon who rotates an external gear with its dexterous paws. The upper volume of the chimney provides a protected habitat which is inaccessible to the raccoons below. Heat generated from the decomposition process is ventilated upwards into the cavity to extend the shoulder seasons for the bird.



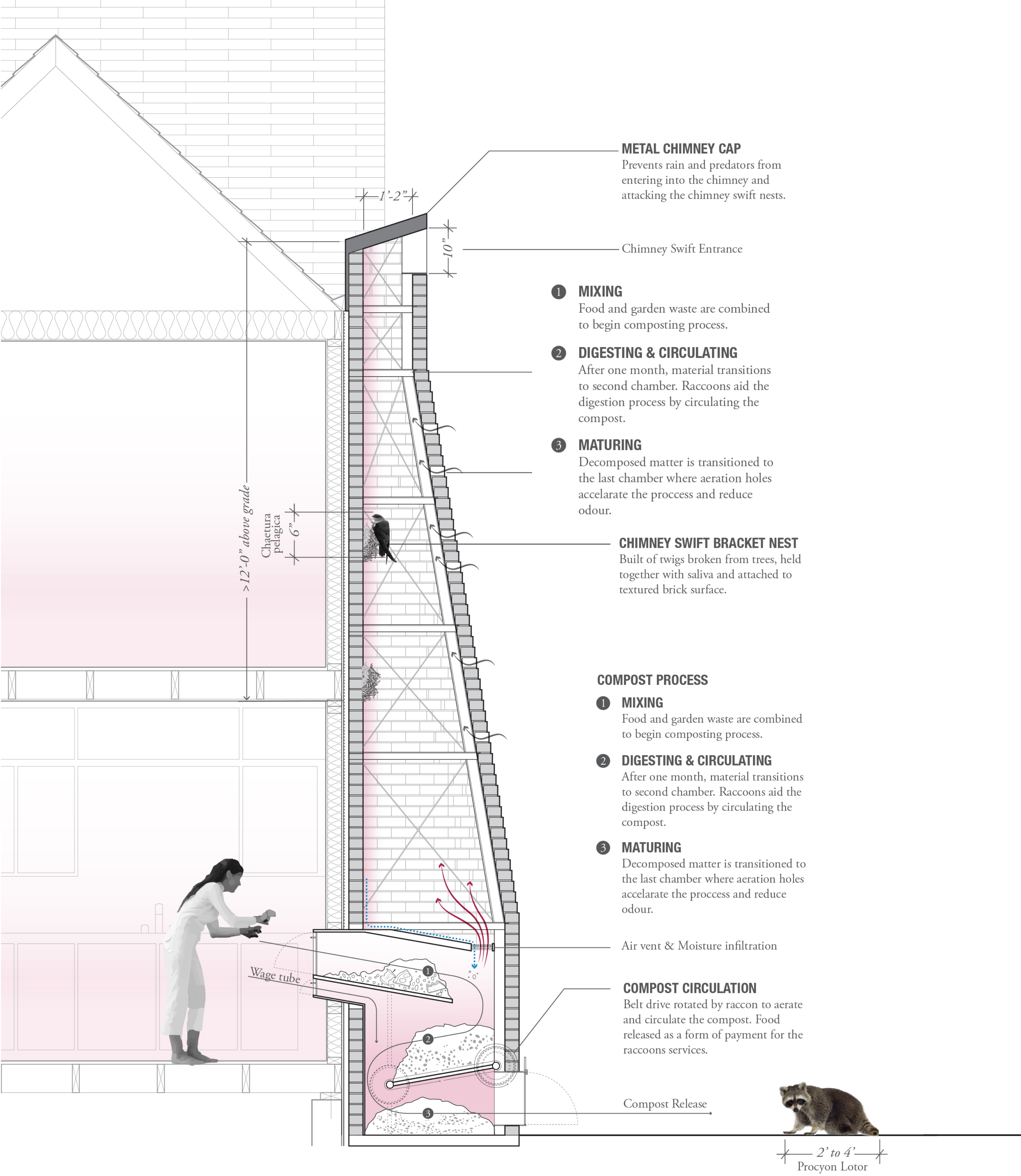
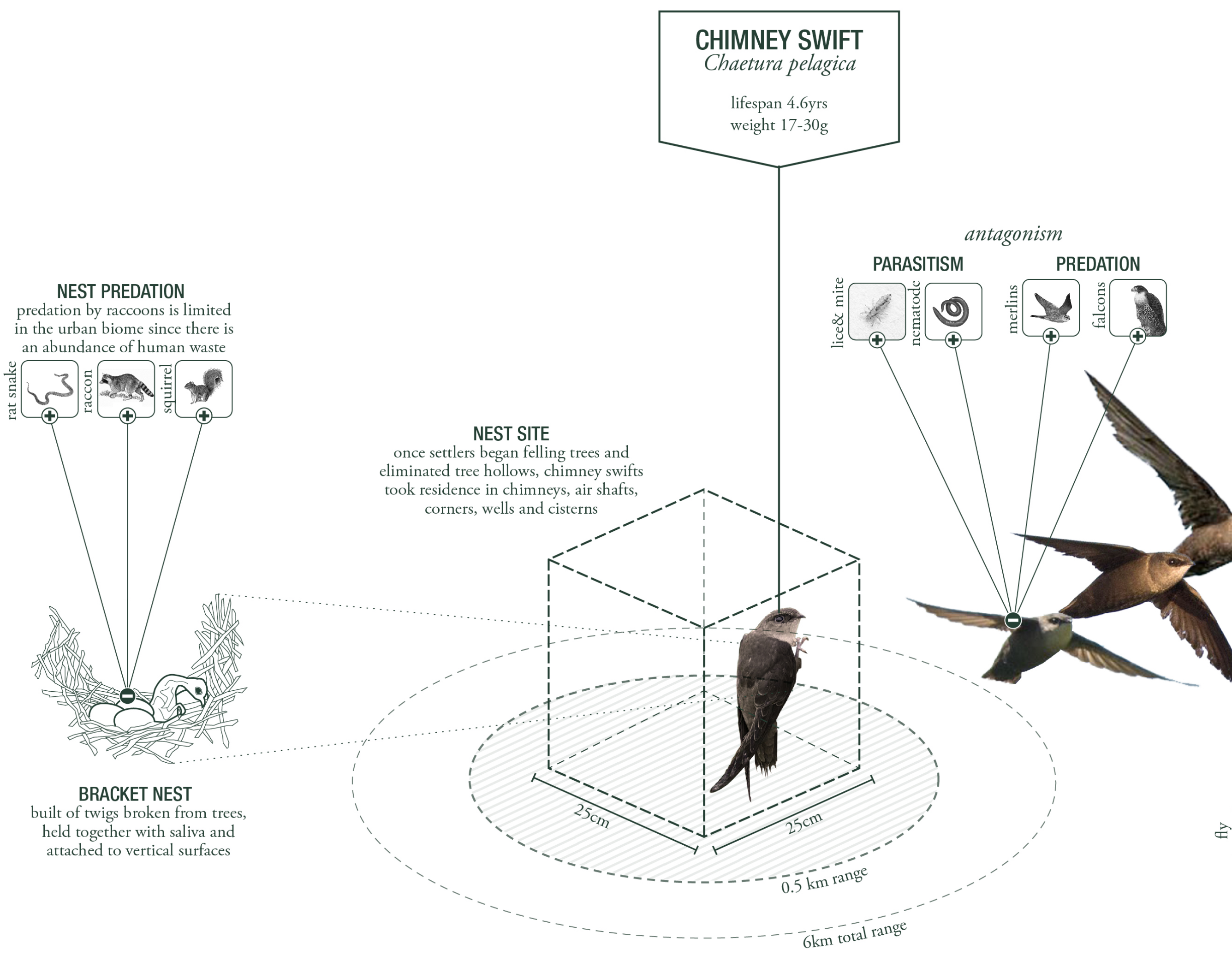
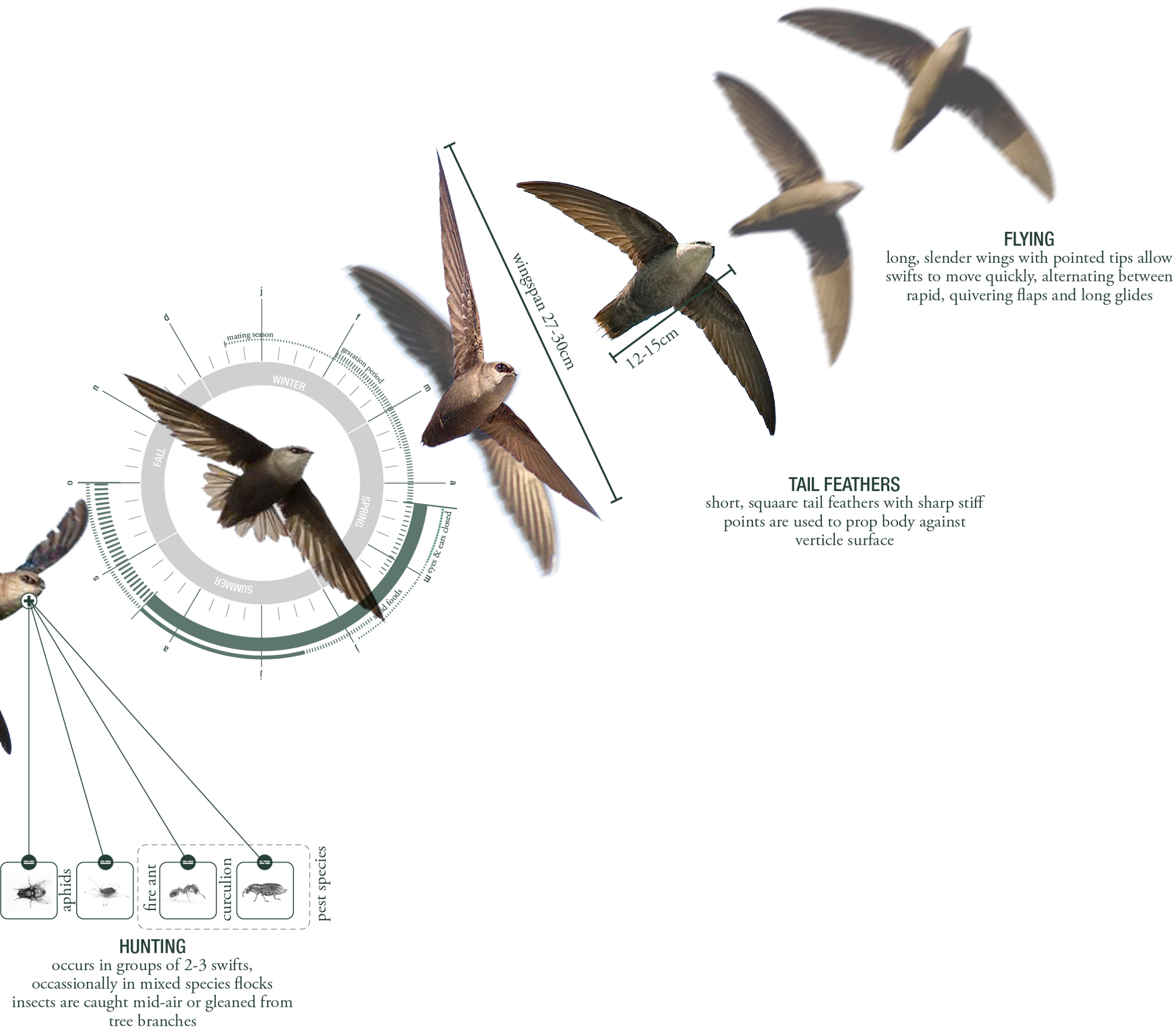


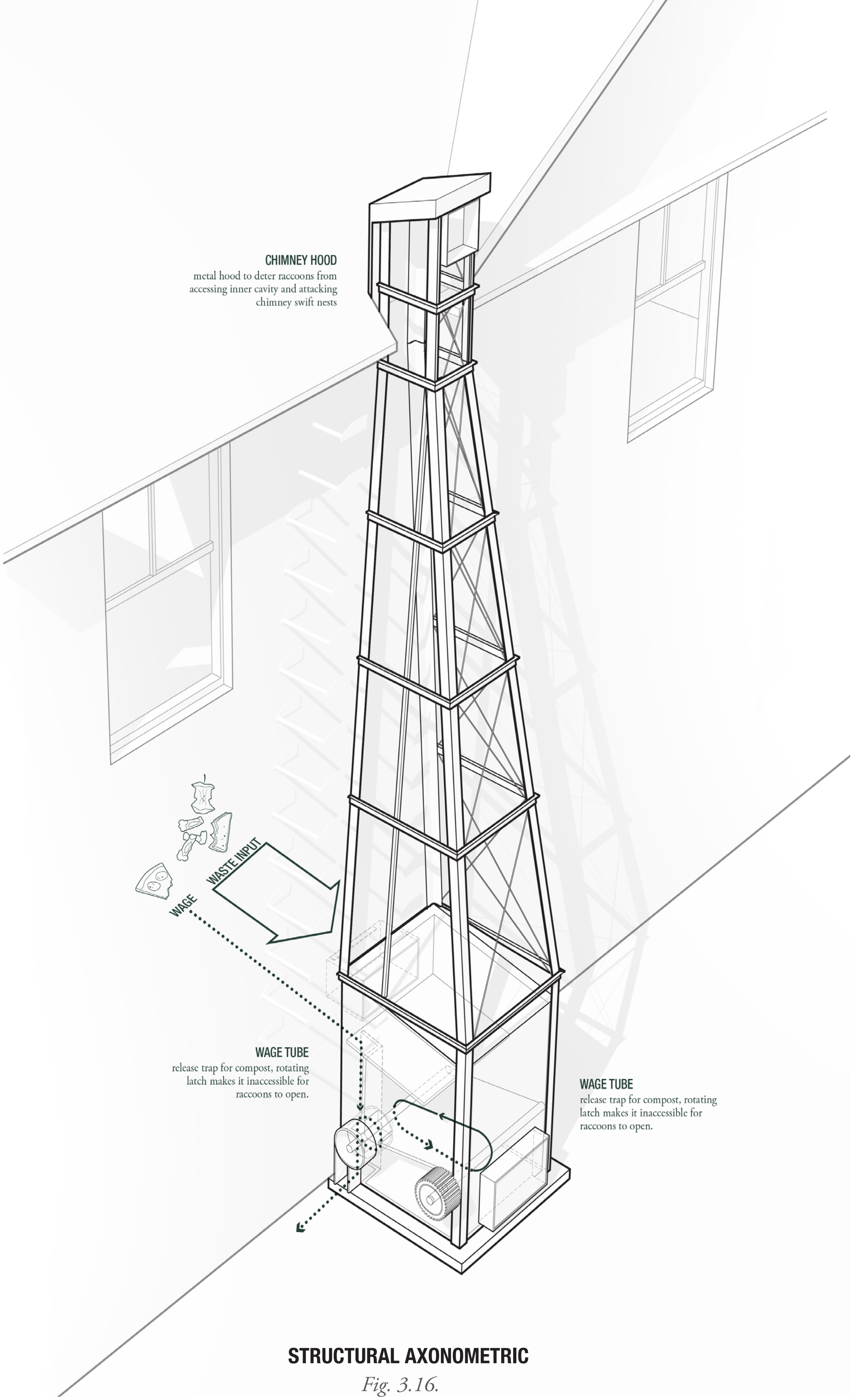
Fig. 3.14. Compost Chimney Section.

CHIMNEY SWIFT

Fig. 3.15. Species Parameters



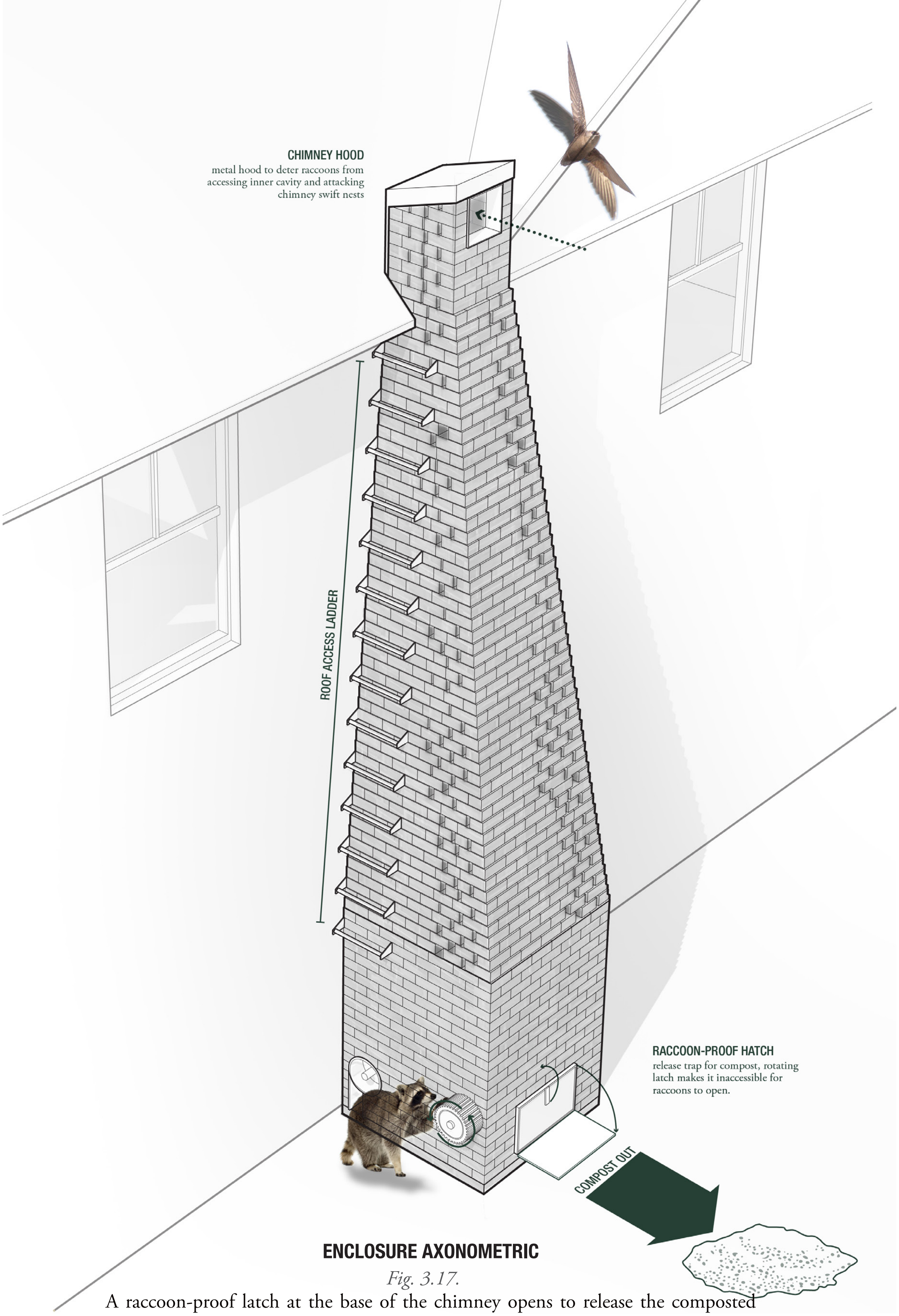

FLYING
long, slender wings with pointed tips allow swifts to move quickly, alternating between rapid, quivering flaps and long glides
wingspan 27-30cm
12-15cm
TAIL FEATHERS
short, squaare tail feathers with sharp stiff points are used to prop body against verticle surface
mating season
gestation period
WINTER
SPRING
SUMMER
FALL
eyes & ears closed
aphids
fire ant
curculion
pest species
HUNTING
occurs in groups of 2-3 swifts, occassionally in mixed species flocks insects are caught mid-air or gleaned from tree branches



STRUCTURAL AXONOMETRIC

Fig. 3.16.

The composting chamber is securely framed within a metal structure that also supports the brick screen. An external gear wheel, which the raccoon can easily rotate, circulates a conveyor belt inside which aerates and moves the compost. In exchange for their labour, the raccoon receives a morsel of food dispensed from the Wage Tube.



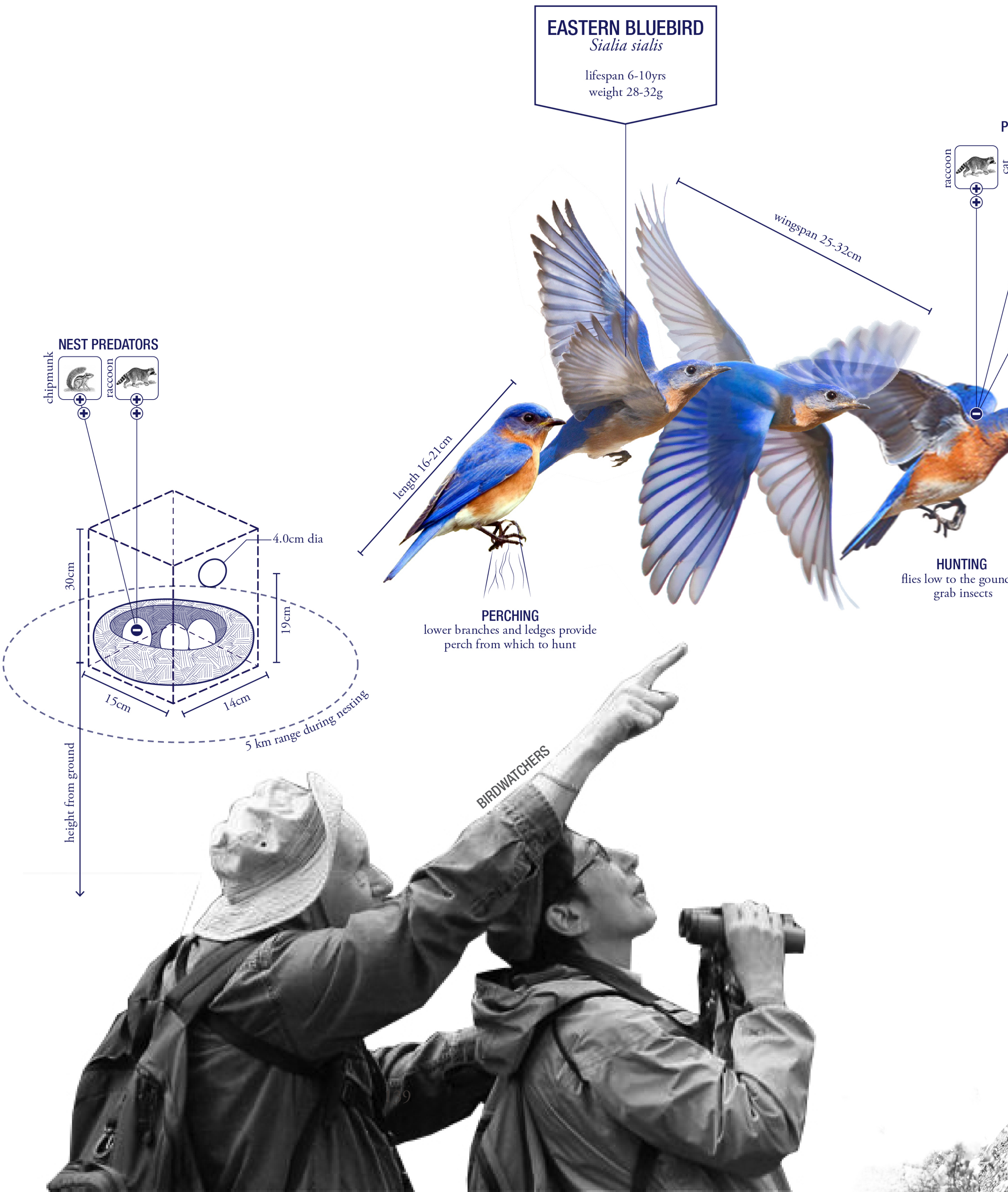
ENCLOSURE AXONOMETRIC

Fig. 3.17.

A raccoon-proof latch at the base of the chimney opens to release the composted soil which is used to fortify the topsoil. An exterior ladder is structurally supported by the metal frame and provides human access to the roof. A metal cap at the top of the chimney prevents predatory animals from entering the cavity and accessing the chimney swift nests.

EASTERN BLUEBIRD

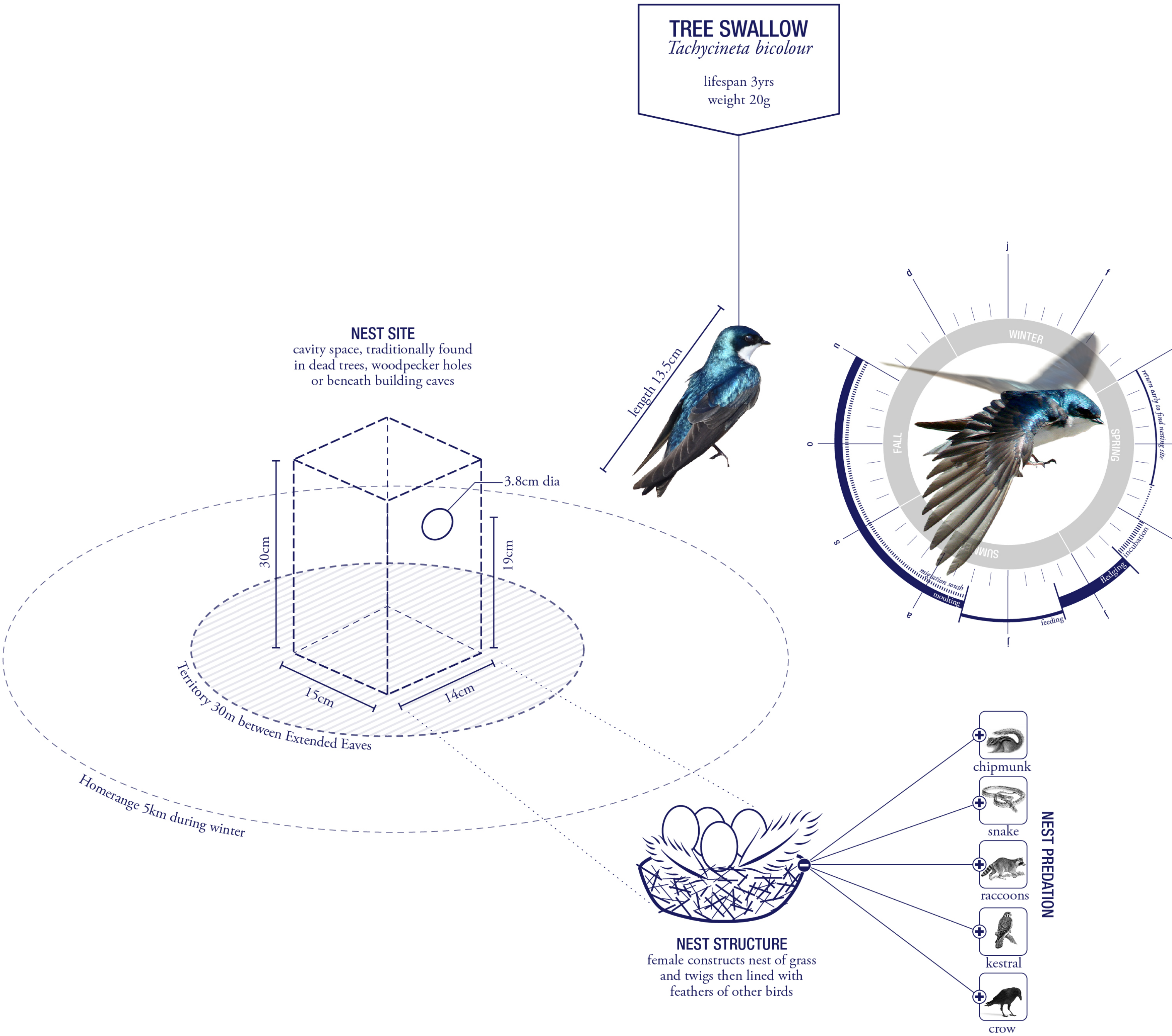
Fig. 3.18. Species Parameters

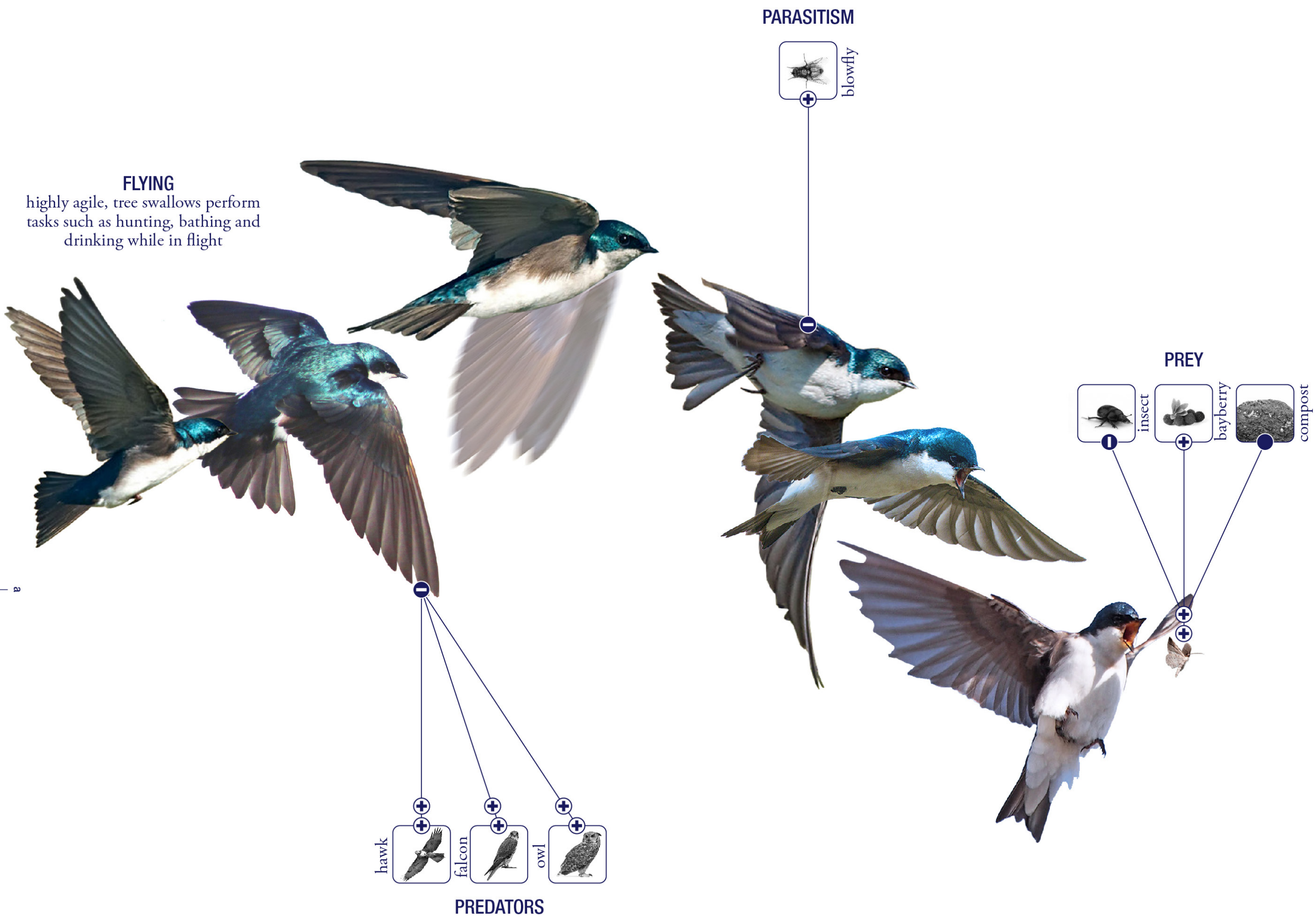


REDATORS
kestral
WINTER
SPRING
SUMMER
FALL
nest building
courtship
mating
nestling
incubation
NEST UP TO 4X PER YEAR
Winter Diet
hawthorn
juniper
earthworm
grasshopper
beetles
Dominant Diet
FOOD SUPPLY
GARDENERS
Between Subjects

TREE SWALLOW

Fig. 3.19. Species Parameters

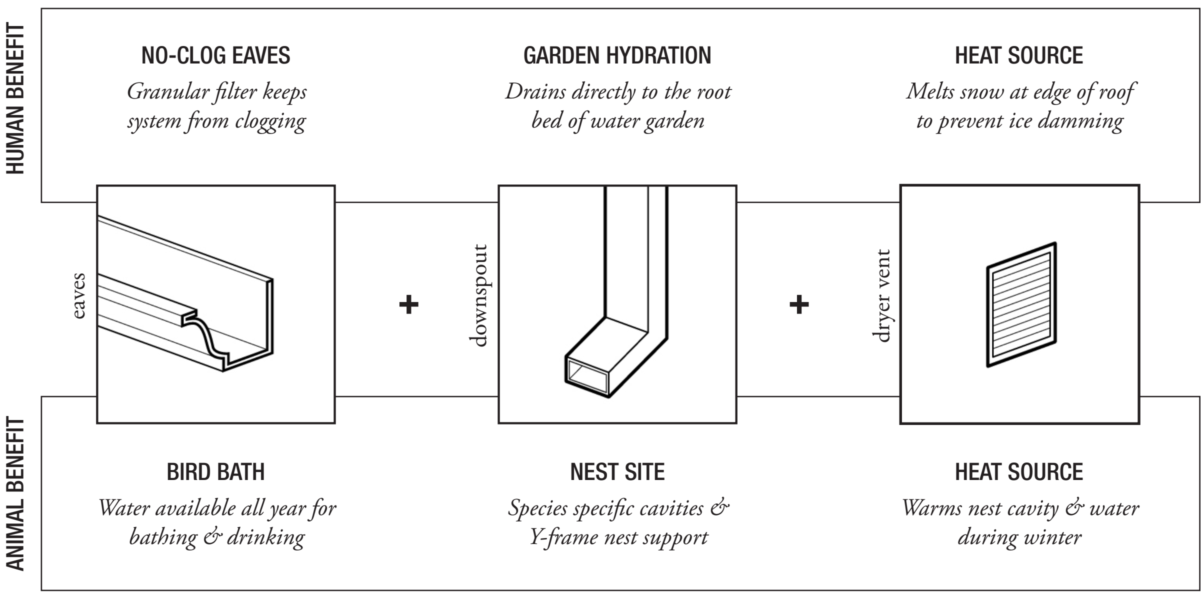



PARASITISM
blowfly
FLYING
highly agile, tree swallows perform tasks such as hunting, bathing and drinking while in flight
PREY
insect
bayberry
compost
hawk
falcon
owl
PREDATORS

EXTENDED EAVE PROSTHETIC

Fig. 3.20.

The Extended Eave merges water mitigation systems with exhaust vents to create extended season habitat for both bluebirds and tree swallows. Each bird defends a territorial range but if nests are properly paired, they are capable of cohabitating successfully. The system also improves the functionality and appearance of typical eaves troughs by using vegetation and extended planting beds to increase rainwater capacity and reduce risk of debris build up. For humans, the Extended Eave enhances the aesthetic and ecological value of the house while encouraging desirable avian species who serve as natural pest control.



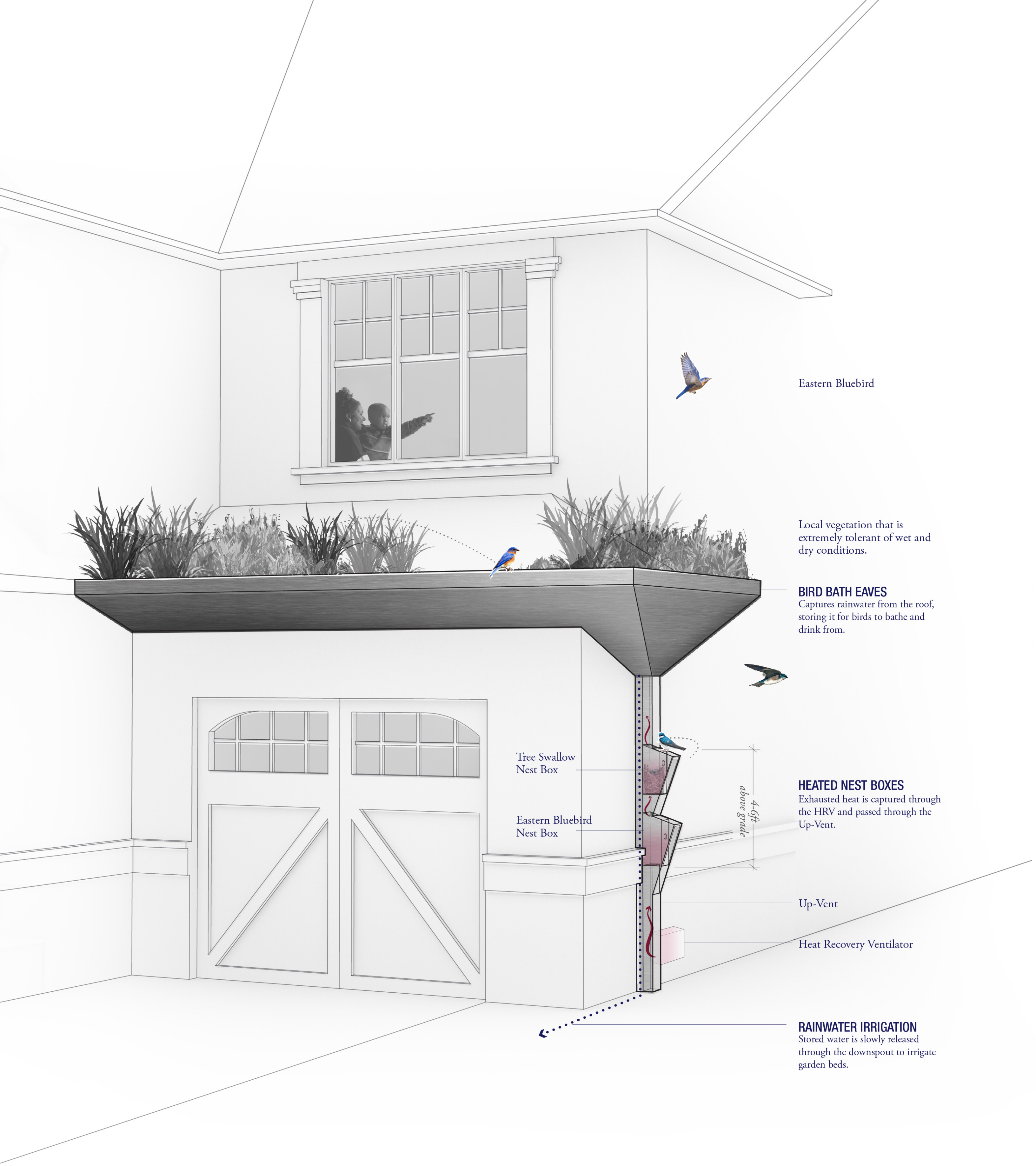
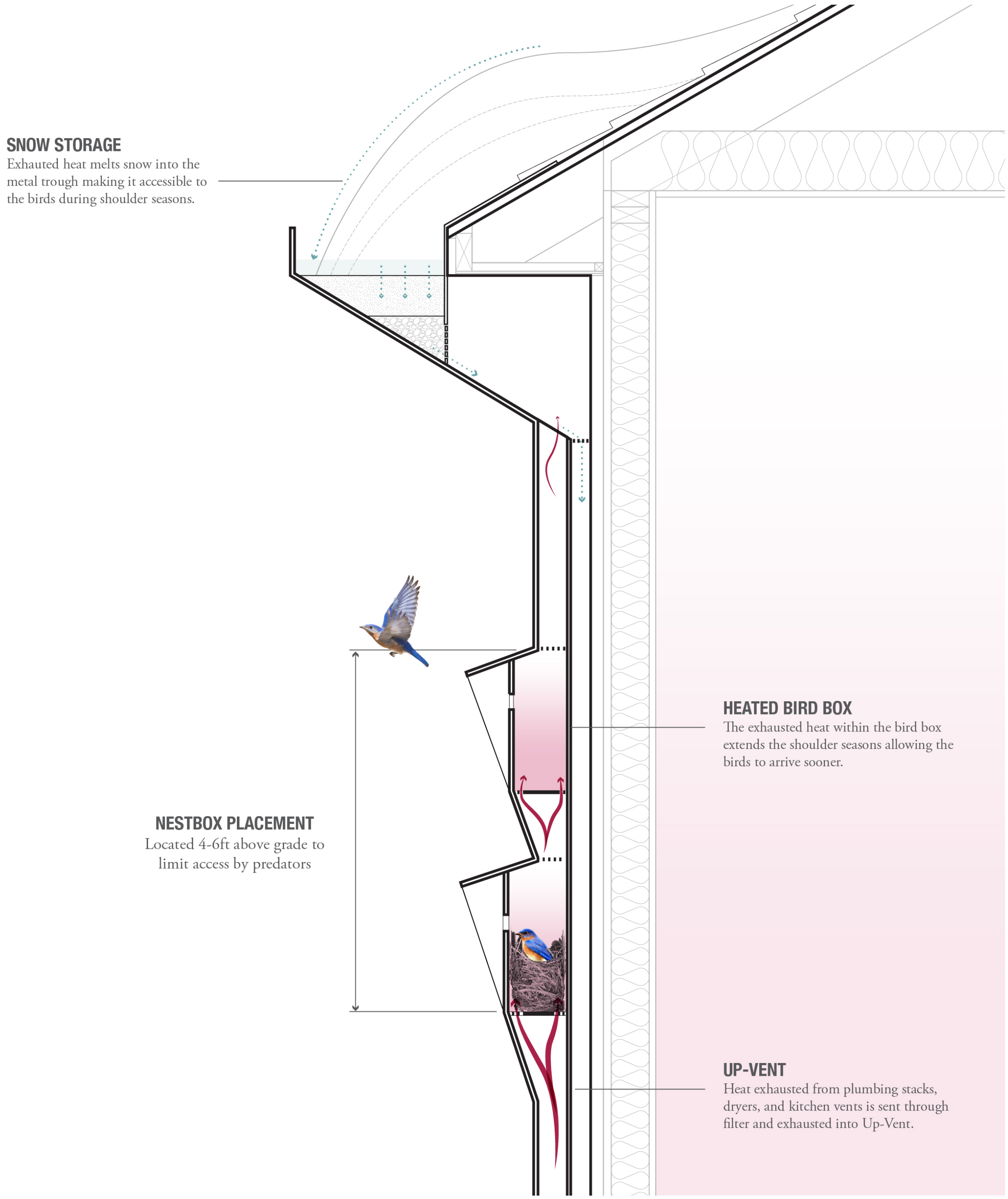


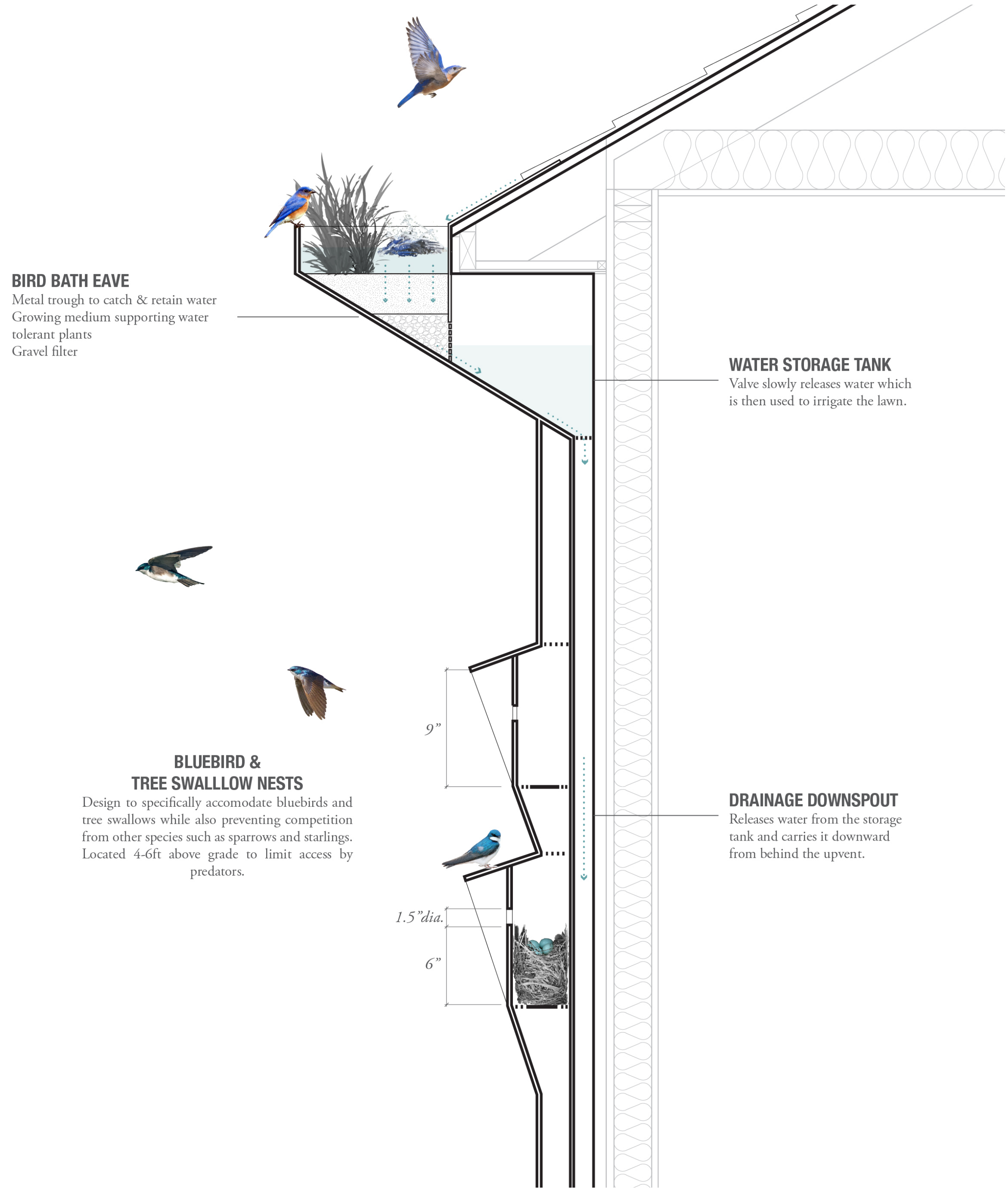
Fig. 3.21. Extended Eave Axonometric.



EXTENDED EAVE SECTION / *Winter*

Fig. 3.22.

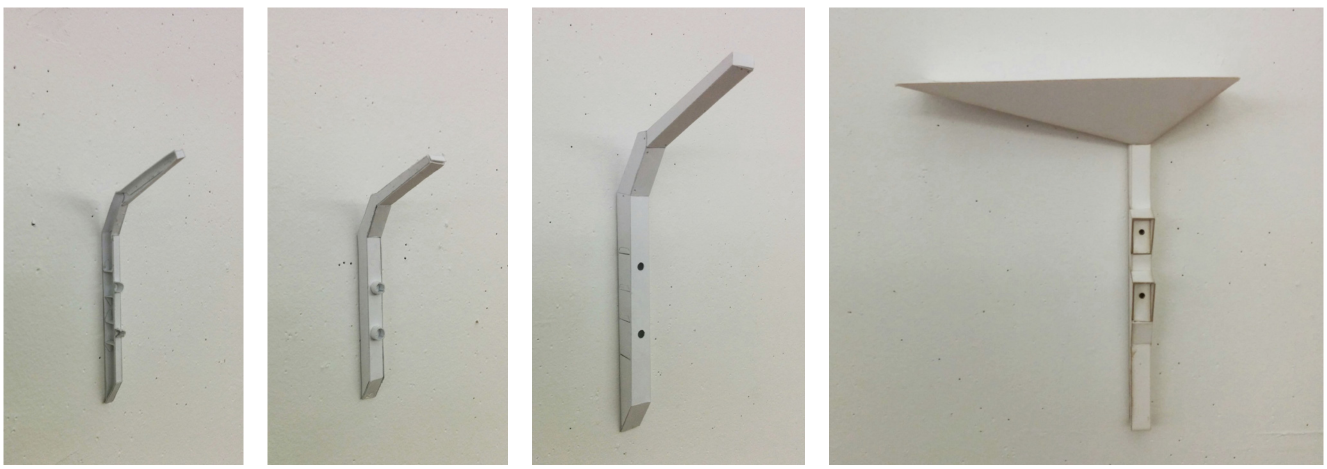
During colder seasons, heat emitted from the dryer, stove and bathroom vents passes through a filtration system and is then exhausted into the exterior up-vent. The heat passes through specifically proportioned bluebird nest boxes providing a warm habitat for these at risk species during the shoulder months. Additional heat radiates upward to melt ice and warm water in the extended eaves trough which functions as a heated bird bath and reduces risk of ice damming.



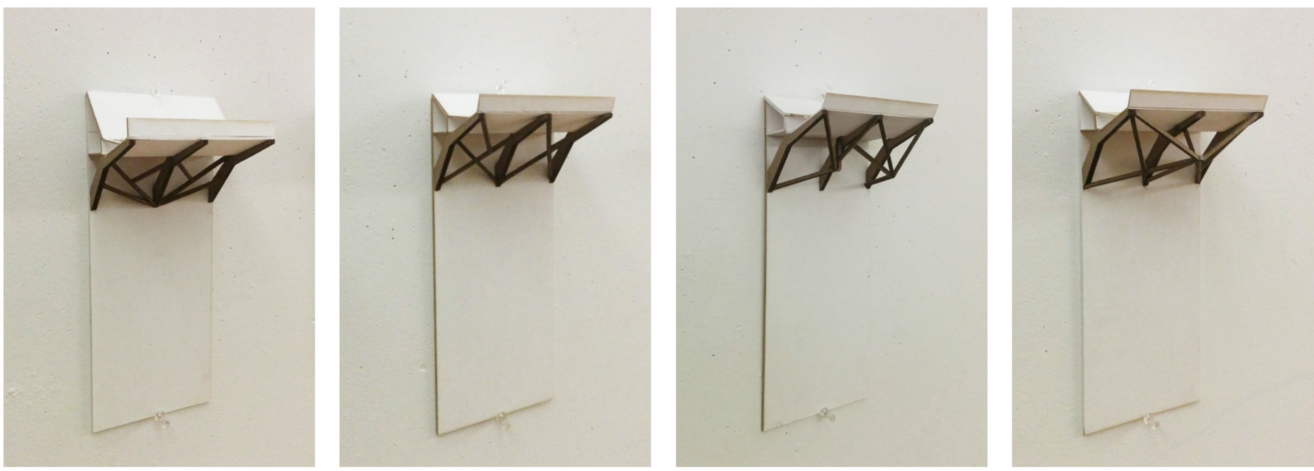
EXTENDED EAVE SECTION / *Summer*

Fig. 3.23.

In warmer months, the Extended Eaves trough above is designed to catch and retain rainwater collected on the roof. Access to water is important for bluebirds and tree swallows who both drink and bath while in flight. Water is slowly released through the gravel filter and trickles down through a airspace between the layers of the upvent.



EXTENDED EAVE / *Bluebird & Tree Swallow*
Fig. 3.24. Scale Prototypes for Upvent with nesting cavities.



EXTENDED EAVE / *Goldfinch*
Fig. 3.25. Scale Prototypes of Branching support for planter.

Fig. 3.26. Thesis defence presentation of prosthetic design drawings and 1:1 Bat Wall and Extended Planter prototypes.

Fig. 3.27. Branching Structure Elevation. Frame structure supports the upper volume of the extended eave and provides opportunities to nest.

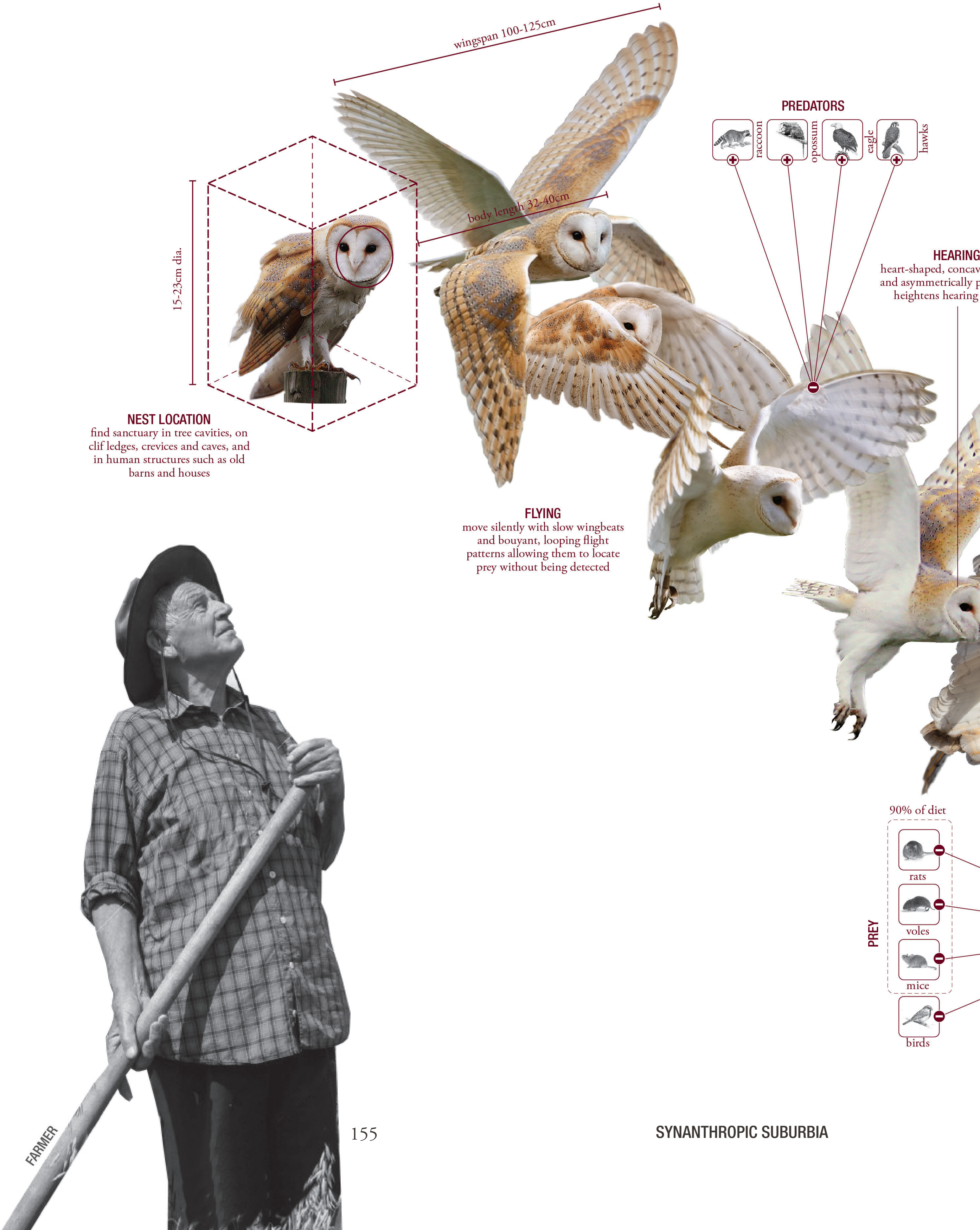
Fig. 3.28. Extended Eave Section

BIRD PERSPECTIVE

Fig. 3.29. Views from Goldfinch nest in the branching structure.

BARN OWL

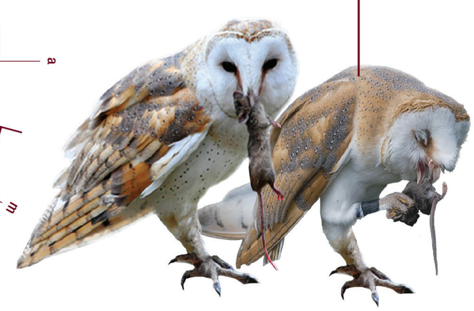
Fig. 3.30. Species Parameters



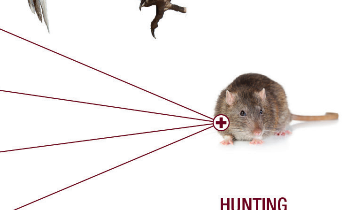
e facial disk
placed hears
capacity

BARN OWL
Tyto alba

lifespan 4yrs on average
weight 400-700g



EATING
consume prey whole including skin and bones, undigestable contents are regurgetated twice daily as pellets which are used to construct nests

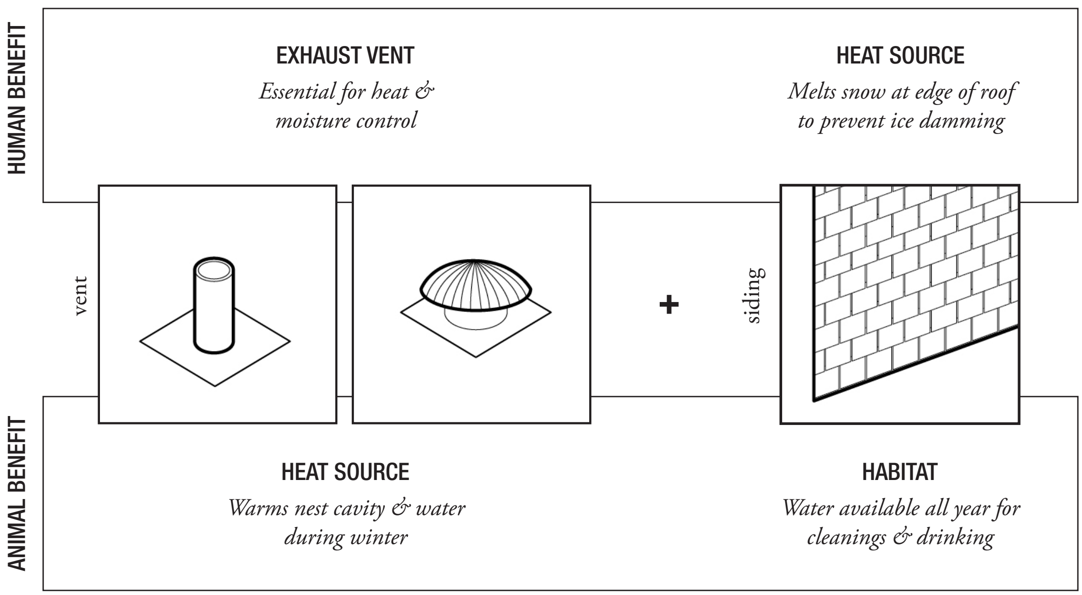


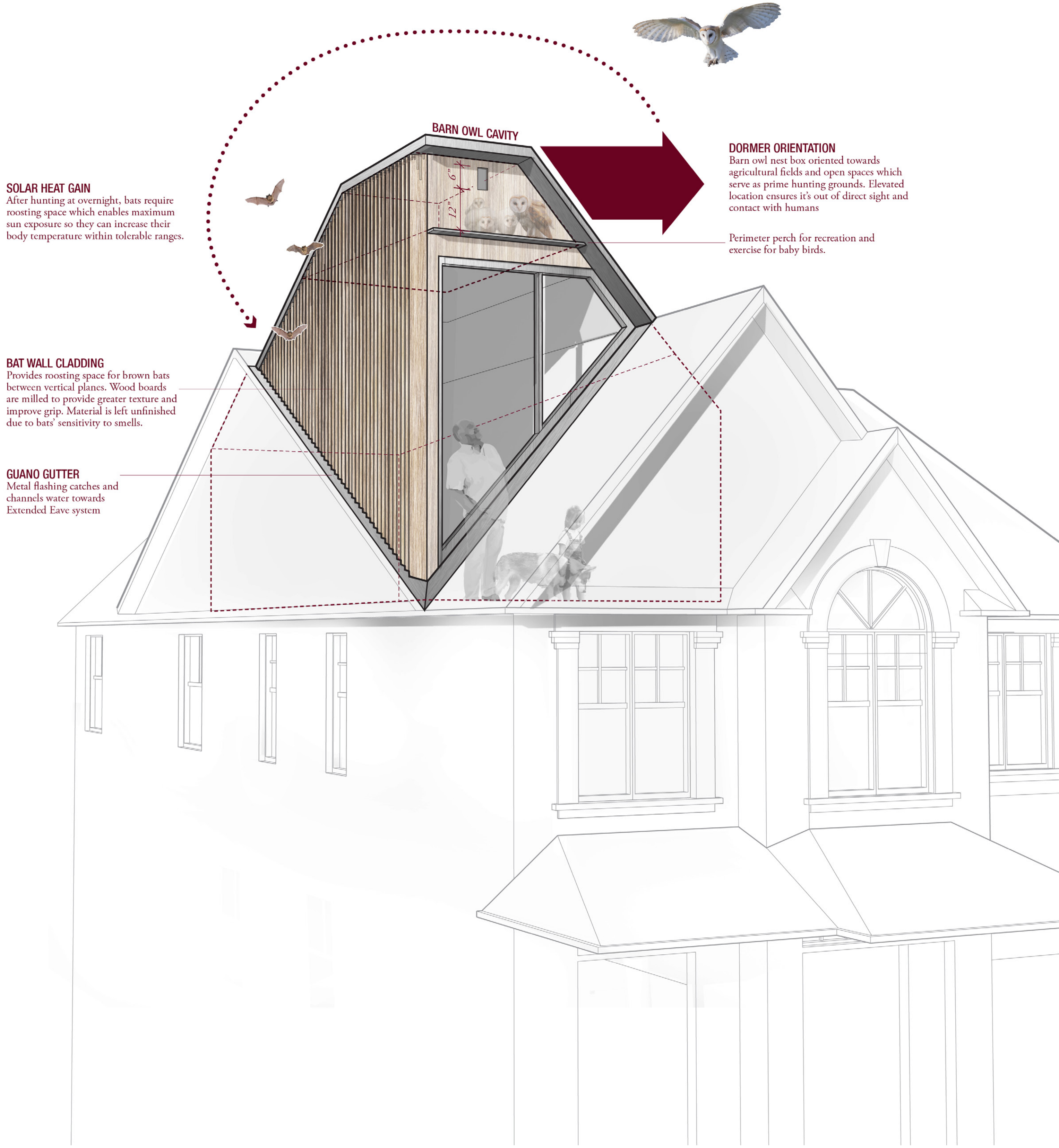
HUNTING
nocturnal hunters who fly slowly over the ground, even hovering, locating prey through acute hearing and ability to see in lowlight conditions

HABITAT DORMER PROSTHETIC

Fig. 3.31.

The typical form of the dormer is reimagined to provide additional real estate for the barn owl, brown bat, and human. Formally it extends the language of the multi-peaked roofs which are widely marketed to suburban home buyers as desirable features. Roof exhaust vents are embedded into the system, ensures they are protected from animal infiltration while also providing heat to the nest box which is situated under the roof of the dormer.



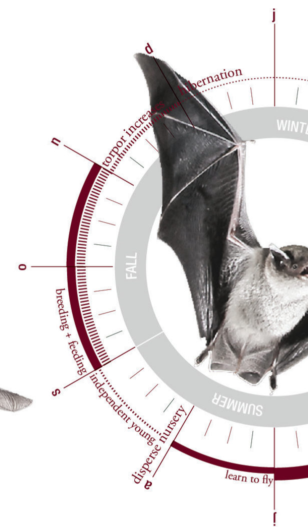

BARN OWL CAVITY
DORMER ORIENTATION
Barn owl nest box oriented towards agricultural fields and open spaces which serve as prime hunting grounds. Elevated location ensures it's out of direct sight and contact with humans
Perimeter perch for recreation and exercise for baby birds.
SOLAR HEAT GAIN
After hunting at overnight, bats require roosting space which enables maximum sun exposure so they can increase their body temperature within tolerable ranges.
BAT WALL CLADDING
Provides roosting space for brown bats between vertical planes. Wood boards are milled to provide greater texture and improve grip. Material is left unfinished due to bats' sensitivity to smells.
GUANO GUTTER
Metal flashing catches and channels water towards Extended Eave system
6"
12"

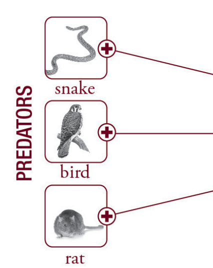
BROWN BAT

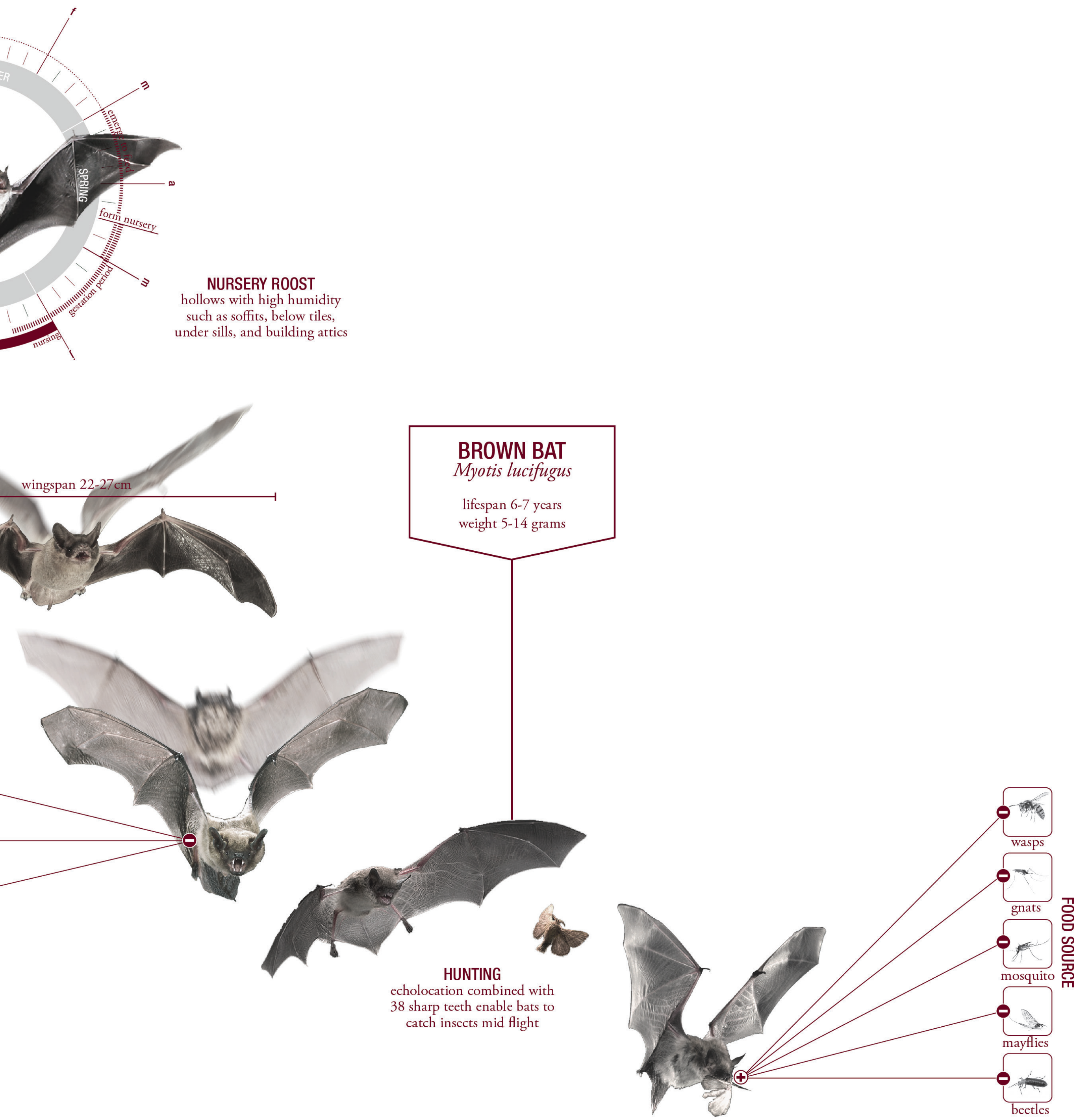
Fig. 3.32. Species Parameters

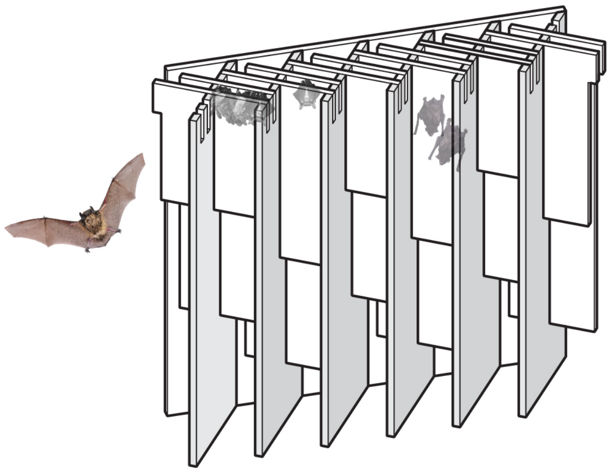
DAY / NIGHT ROOSTS
during the day, typically roost in buildings, trees, under rocks and wood piles
at night will move to a more constrained location, often in the same building, allowing them to roost together for warmth

NAVIGATION
use echolocation to orient themselves by emitting high intensity FM sounds 1-5ms in length between 40-80khz






SPRING
form nursery
gestation period
nursing
NURSERY ROOST
hollows with high humidity such as soffits, below tiles, under sills, and building attics
wingspan 22-27cm
BROWN BAT
Myotis lucifugus
lifespan 6-7 years
weight 5-14 grams
HUNTING
echolocation combined with 38 sharp teeth enable bats to catch insects mid flight
wasps
gnats
mosquito
mayflies
beetles
FOOD SOURCE



Ventilation holes from the barn owl box transfers heat to Bat Wall Cladding system to help bats increase body temperature after night hunting

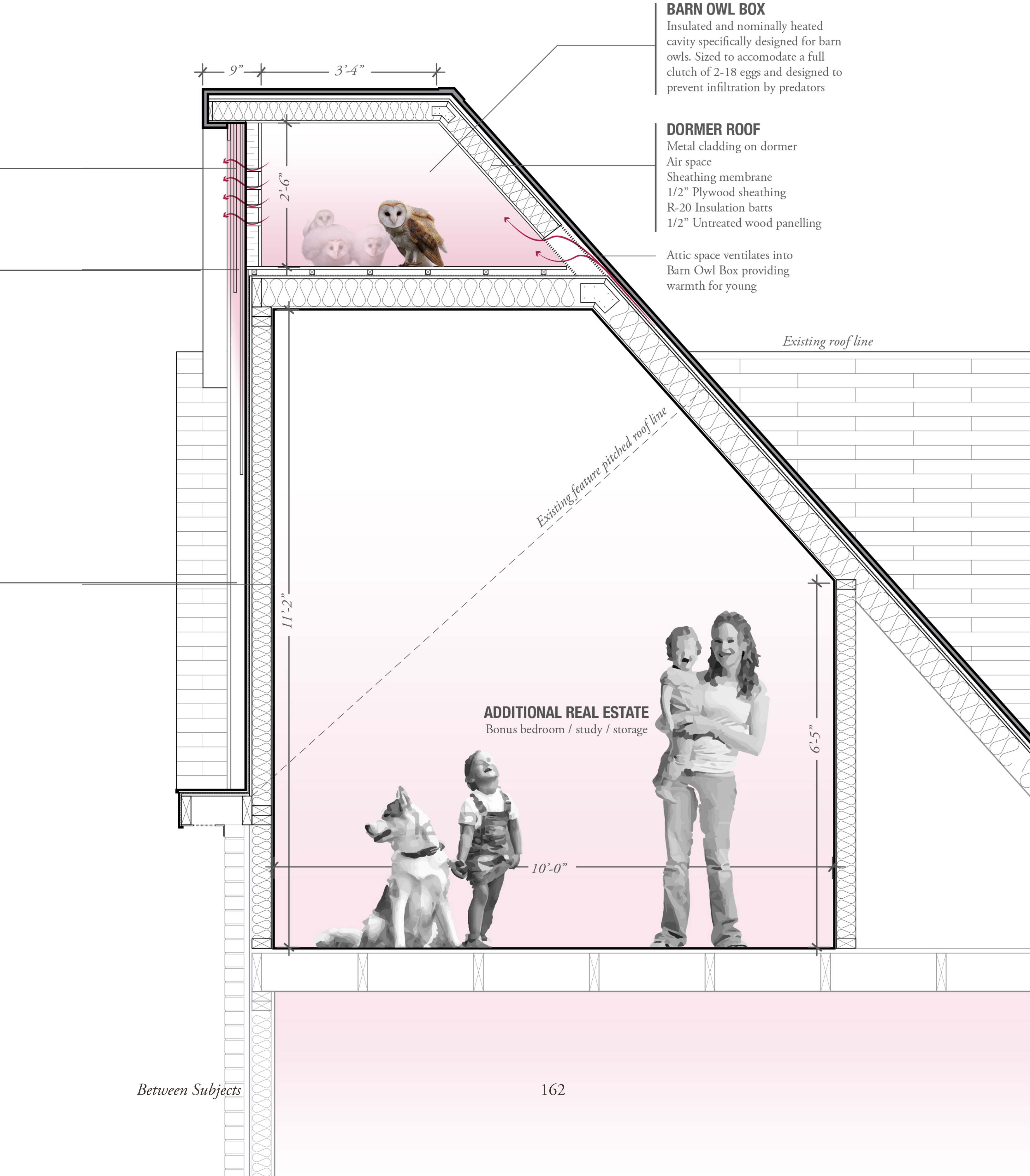
BAT WALL CLADDING
1/2" Wood panels w/
textured, unfinished surface
1/2" Slotted vertical wood structure
1/4" Plywood backing

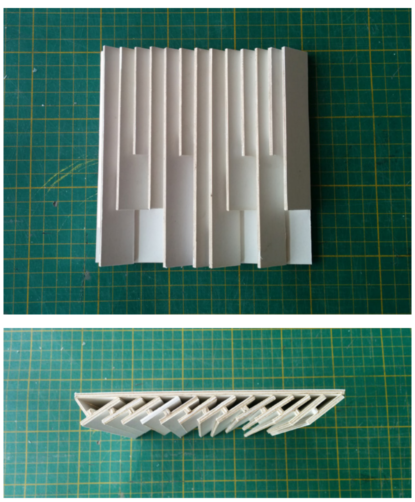
DORMER WALL
Sheathing membrane
2"x4" Wood framing at 2' o.c.
R-20 Insulation batts
Polyethelene air barrier
1" Gypsum board

HABITAT DORMER SECTION

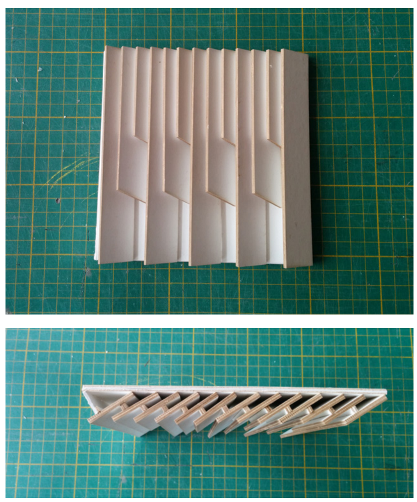
Fig. 3.33.

The surface area of the dormer is wrapped in the Bat Wall Cladding system which is comprised of textured wood surfaces, slotted together to form narrow gaps ideal for bat inhabitation. It provides a variety of depths and textures which bats can occupy at different times of day. Within the volume of the dormer, the homeowner gains enough square footage for an additional bedroom, study, or play room thereby increasing the homes real estate value.

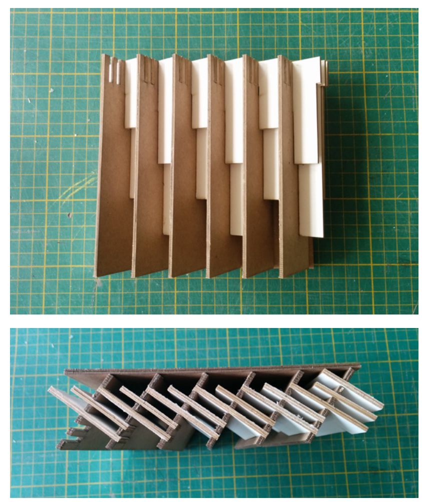

BARN OWL BOX
Insulated and nominally heated cavity specifically designed for barn owls. Sized to accomodate a full clutch of 2-18 eggs and designed to prevent infiltration by predators
DORMER ROOF
Metal cladding on dormer
Air space
Sheathing membrane
1/2” Plywood sheathing
R-20 Insulation batts
1/2” Untreated wood panelling
Attic space ventilates into Barn Owl Box providing warmth for young
9”
3’-4”
2’-6”
Existing roof line
Existing feature pitched roof line
11’-2”
6’-5”
ADDITIONAL REAL ESTATE
Bonus bedroom / study / storage
10’-0”



Scale Prototype 1

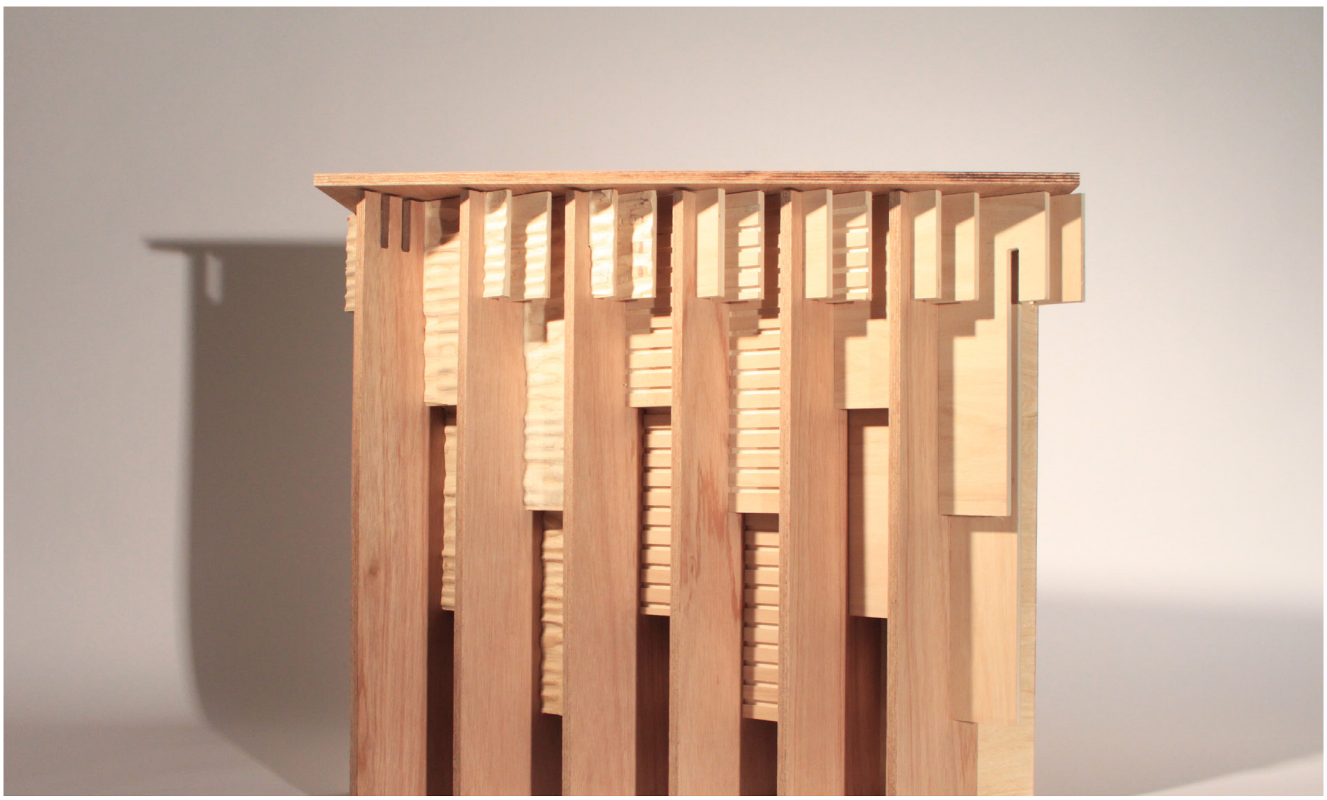


Scale Prototype 2



Scale Prototype 3

Fig. 3.34. Bat Wall prototypes built from museum board and millboard at 1:5 scale



1:1 SCALE PROTOTYPE OF BAT WALL CLADDING

Fig. 3.35. Bat Wall prototypes built at 1;1 scale. CNC profiles from 1/2" birch plywood and 1/2" marine plywood

PROTOTYPE INSTALLATION

Fig. 3.36. Bat Wall prototype installed on May 29th, 2015, onto a typical suburban house in Kitchener, Ontario using two masonry bolts anchored into the brick.

Fig. 3.37. Bat Wall prior to take down on August 22, 2015 at 6:53pm.

Cambridge 1 / Elev. 1 / 2,900 sqft

Cambridge 1 / Elevation 2 / 2,916 sqft

Cambridge 2 / Elev. 1 / 3,032 sqft

Cambridge 2 / Elev. 2 / 3,032 sqft

Cambridge 3 / Elev. 2 / 3,240 sqft

Westport 2 / Elevation 1 / 2,566 sqft

Westport 3 / Elevation 2 / 2,691 sqft

Westport 4 / Elevation 1 / 2,872 sqft

Westport 4 / Elevation 2 / 2,872 sqft

Westport 5 / Elevation 1 / 2,974 sqft

INVENTORY OF SUBURBAN HOUSE MODELS

Fig. 3.38. Single-family house marketing images are owned and distributed by Starlane Home Construction. The constructed houses are located in Upper Unionville, a neighbourhood in Markham, Ontario.

SYNANTHROPIC SUBURBIA

Synanthropic Suburbia identifies the domestic realm as the most contentious space of interaction between human and animals. It is there, that an individuals has the strongest sense of ownership and territoriality over space. Therefore, the suburban house is the ideal situation in which to challenge and redefine conceptual limits through the design of new human animal interfaces. The prosthetics are designed to take advantage of the highly regular structural systems and enclosure methods utilized by developers and therefore can be deployed across a multitude of house design models. The objective is for the synanthropic prosthetics to invade the suburbs, multiplying across neighbourhoods to generate significant ecological impact through the repetition of a small intervention.

MARKETING VISUALIZATION

Fig. 3.39. Starlane model Greystone 3, Elevation 2 with a total area of 2,300sqft. The visualization for Greystone 3, like all of the others, presents a vaguely traditional home situated in a vast green lawn surrounded by mature trees and lush gardens. However, it is purely conceptual and is not part of the developer's commitment to new homeowners. Since the construction process strips the landscape of any pre-existing ecology, an entirely new novel ecosystem must be created.

CONSTRUCTED REALITY

Fig. 3.40.

The surrounding trees of the marketing image are replaced with neighbouring houses, the lush lawn is a small patch of meak sod, and a single young sapling fails to provide any shade or shelter for the community. At their emergence, the prototypical suburban community is a lackluster novel landscape. However, the roof vents and flashing details—not otherwise rendered into the marketing material—provide opportunities for infiltration and nesting.

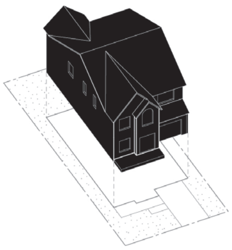
SYNANTHROPIC SUBURBAN HOUSE

Fig. 3.41.

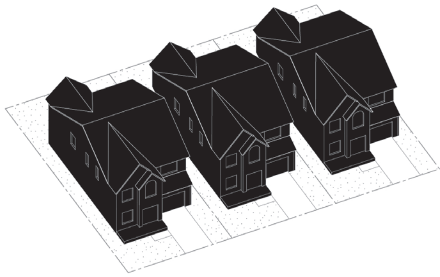
[Following page] The application of prosthetics embed ecological potential into the architecture of emerging suburban ecosystems. Unlike trees, which take years to mature and support animal inhabitation, the prosthetics provide readily available habitat opportuniteis for targetted animals and secondary species that benefit from similar environmental conditions. The prosthetics are suble appendages that enhance the architectural language of the house and, more importantly, integrate ecological and performative value. The synanthropic systems leverage the architecture of the house in order to cultivate a diverse and viable novel ecosystem.

part four

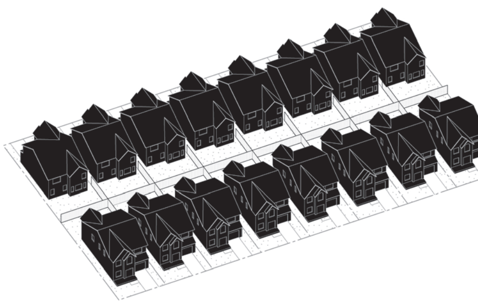
SYN-URBAN ASSEMBLAGES



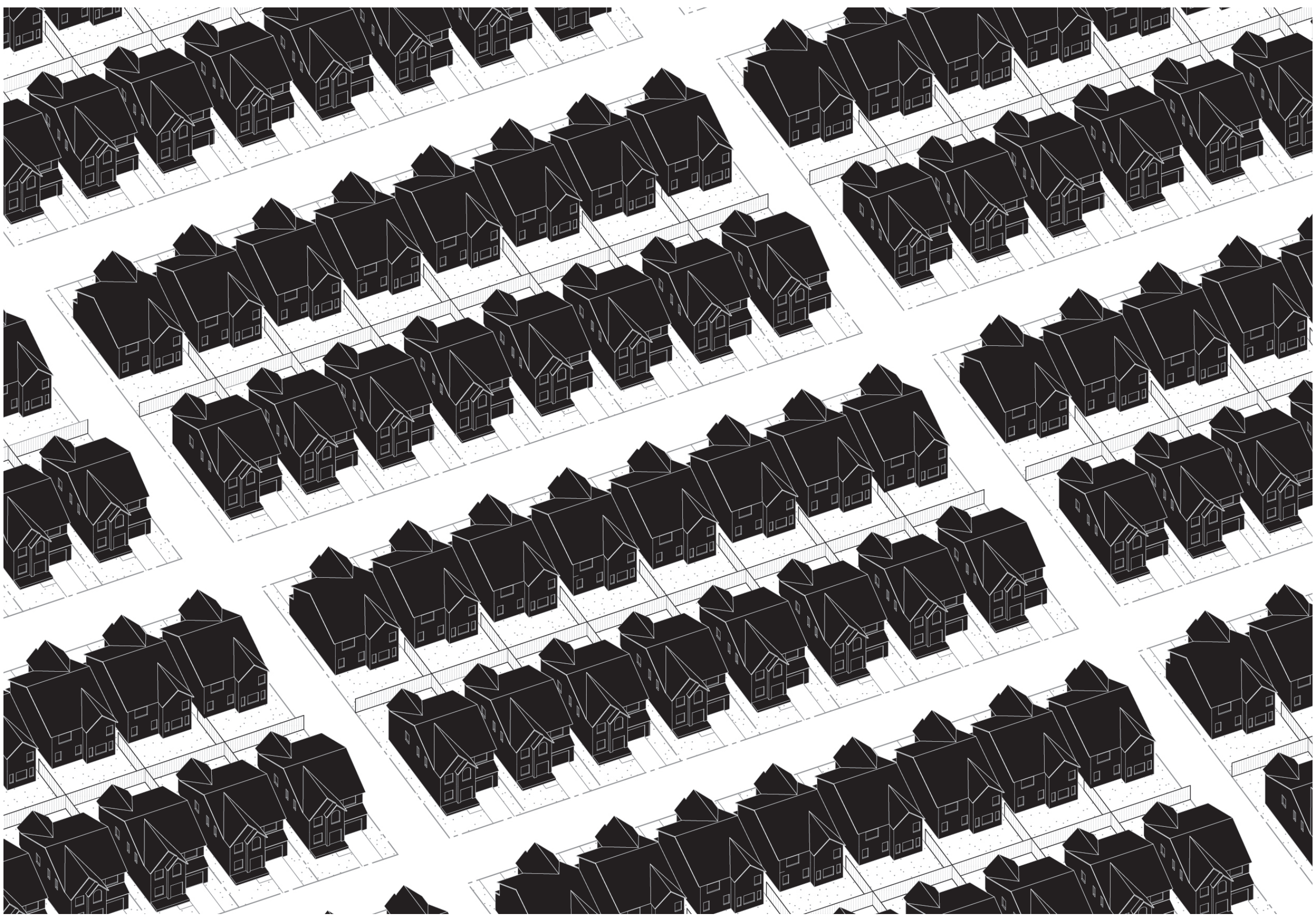
Domestic Element



Multiplied Lots



Suburban Block



Background Ecological Matrix

Fig. 4.1. Suburban Matrix. Typical block establishes background ecological matrix of the suburbs.

Suburban Edge

In Canada, the suburbs are a pervasive condition that occur at the peripheral edges of major metropolitan areas. Engrained cultural expectations and conventional construction methods ensure that the suburbs take the same general form—single-family, detached homes on grassy lots with limited access to services within walkable distance, and subsequently, a reliance on vehicular transportation—in other words, the American Dream. It is widely accepted that the global population is urbanizing, however the reality in North America is that the greatest population growth is occurring in the suburbs. From 1991-2001 Canada's eight major cities experienced an average 59% increase in low density housing. Of all development that occurred, 25% of it was built 25km or more outside of the city center. During the following five years, Toronto experienced a 1% increase in population while Milton, a suburb of Toronto, saw a 56.5% in growth. By 2011, 66% of Canada's population lived in some form of suburbs. At that point it was definitive, "Canada is a suburban nation."[2]

Suburbs exist at the edge, functioning as a borderland between dense urban centers and expansive agricultural regions. The novel ecosystems produced by development form buffer zones around cities, spaces of intense, often conflicting, anthropogenic and ecological pressures. Jennifer Wolch writes in her essay *Anima Urbis*, "Nowhere is the complexity of human-animal spatial orderings more evident than in the urban-wildlands surrounding of metropolitan regions. Here, zoning ordinances and land use plans have often been used to allocate animals and people to designated areas, but such crisp divisions are rarely so straightforward on the ground."[3] The suburbs therefore provide a rich field in which to explore strategies for mediating human and animal relationships within novel ecosystems.

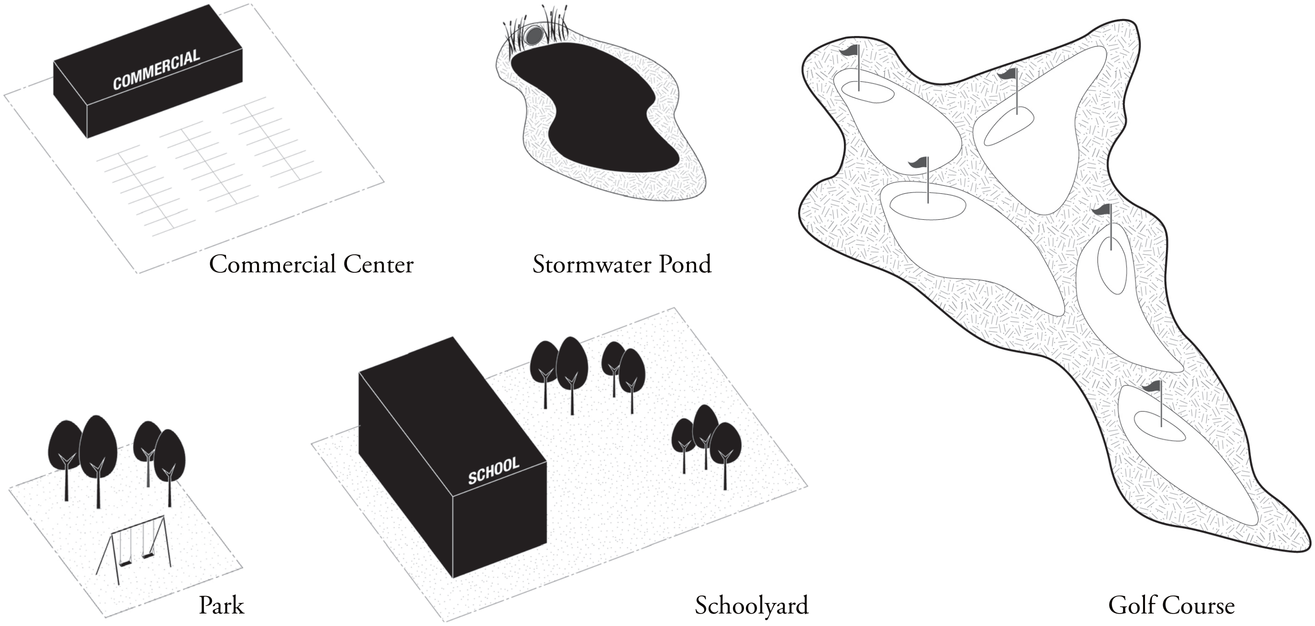


Fig. 4.2. Suburban Patch Types.

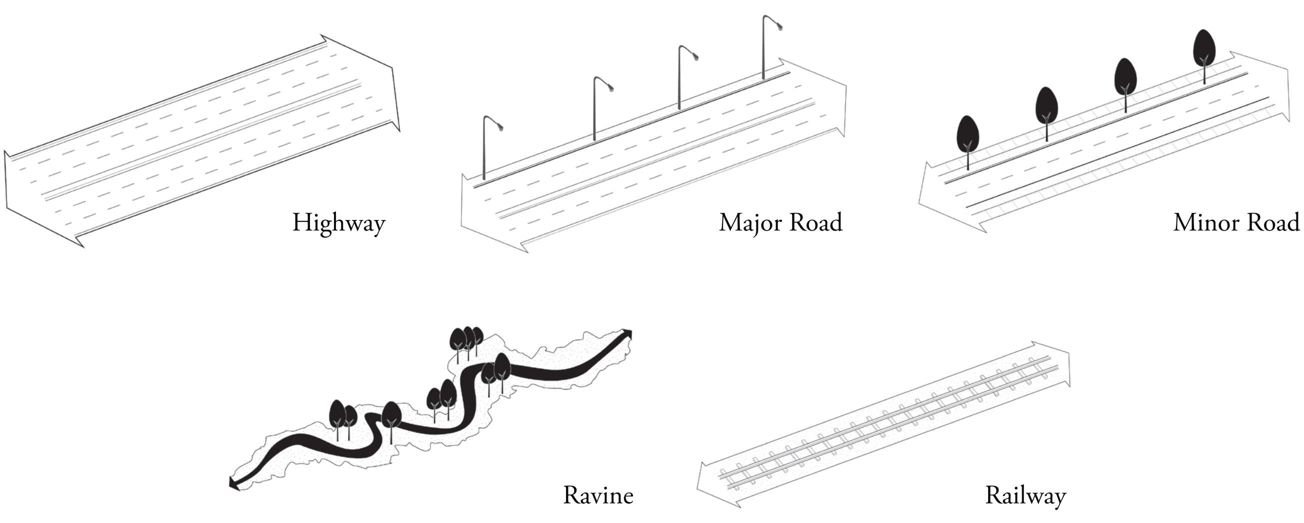


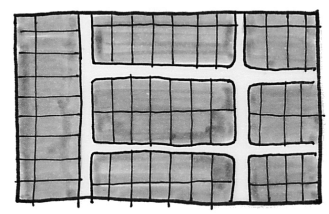
Fig. 4.3. Suburban Corridor Types.

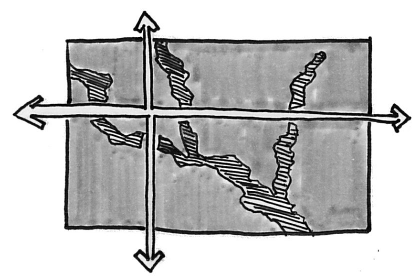
Suburban Landscape Ecology

Richard Forman outlined the principles of landscape ecology in the book, Land Mosaics, which defined landscapes as a series of *patches, corridors*, and *matrices* which assemble to create diverse habitats.[4] A *matrix* is defined as a background ecosystem or land-use type. It is characterized by extensive cover, high connectivity and / or major control over the system dynamics. A *patch* is a relatively homogeneous, nonlinear area that differs from its surroundings. A *corridor* is a strip of a particular type that differs from the adjacent land on both sides. It can function as a conduit, barrier and / or habitat. A *mosaic* is an assemblage of these patches, corridors, and matrices. The functional integrity of a mosaic is evaluated in terms of the ability of the pattern and scale to establish overall connectivity.

Suburbanization, however, has created new forms and scales of ecological mosaics. The thesis attempts to unpack the landscape ecology of the suburbs using the language of Richard Forman. Within this framework, the house is defined as an abiotic spatial element, capable of supporting certain local needs. Each house is situated on a piece of land which is then multiplied to create a suburban block, defined by roads. The suburban block is proliferated across a landscape to establish a *background ecological matrix*. *Patches*, such as community parks, golf courses, commercial zones, schools, and woodlots, punctuate the matrix of suburban blocks. Ravines, roads, highways, and rail lines define *corridors* which function as conduits for some human and non-human species and simultaneously act as barriers or filters for others. All of these landscape elements assemble to form a *suburban land mosaic*.

The anthropogenic processes which generate these suburban mosaics often produce fragmented and discontinuous landscapes that prioritize human spatial patterns over non-human movement and inhabitation requirements. The thesis research identifies three issues which limit the ability for animals to cohabit within the suburban biome. The primary issue, which this thesis will focus on, is that the conventional fabric of suburban blocks, particularly at the beginning of their development, are not capable of supporting diverse species occupation and migration. The predominance of monoculture lawns, limited diversity and density of vegetation, and lack of viable nesting sites due to well-sealed building enclosures and absence of mature trees, renders the newly developed, suburban landscape inhospitable to less adapted species. The second issue is the conflict between human and animal vectors of movement. Major highways and arterial roads bisect natural corridors, limiting animal movement to a restricted home range. In addition, vehicular collisions pose the greatest threat to terrestrial and avian species. The third issue is how patterns of human development fragment existing habitat patches reducing the viability of a landscape to support diverse animal inhabitation. Addressing the issues of discontinuity and lack of habitat are





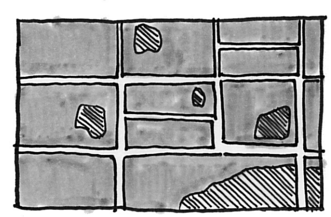
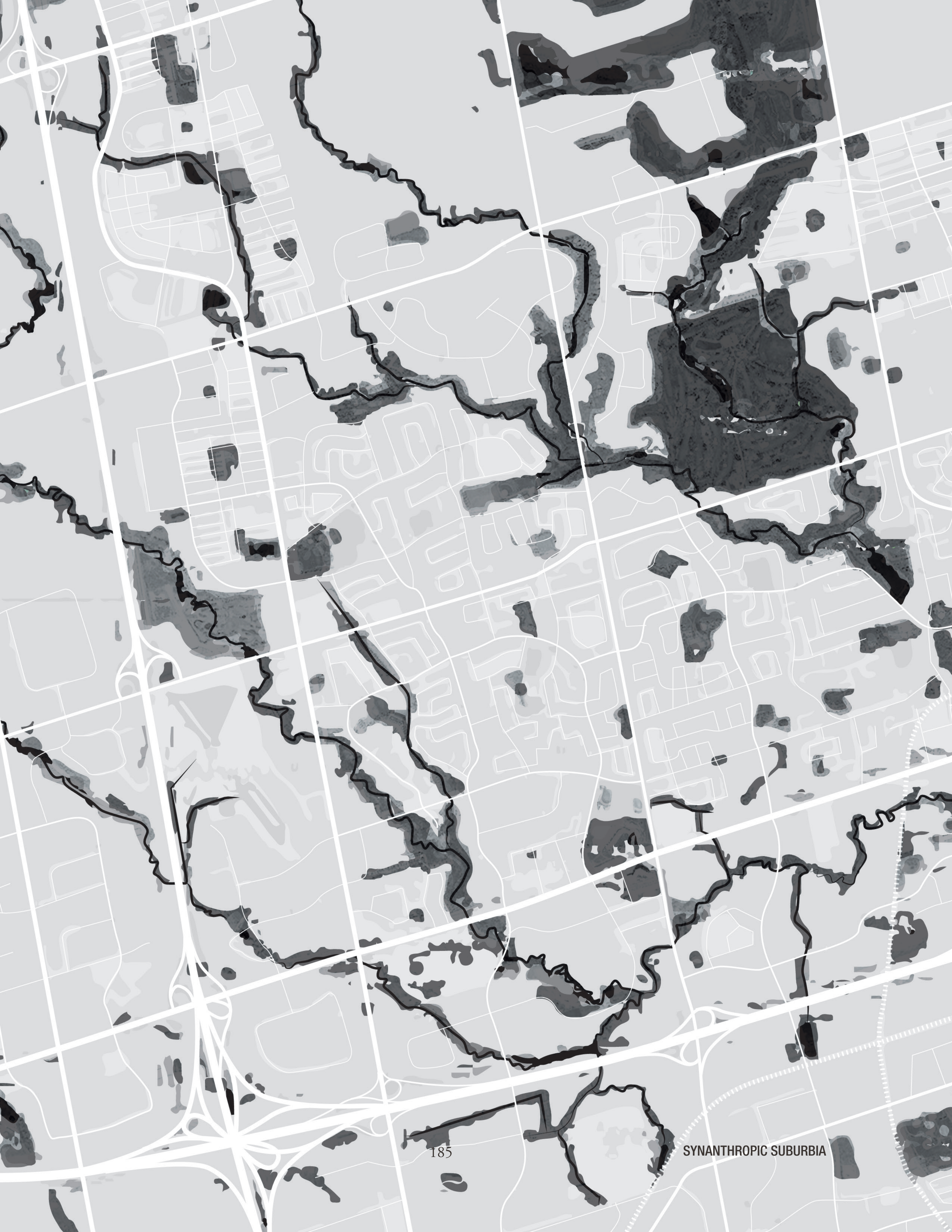
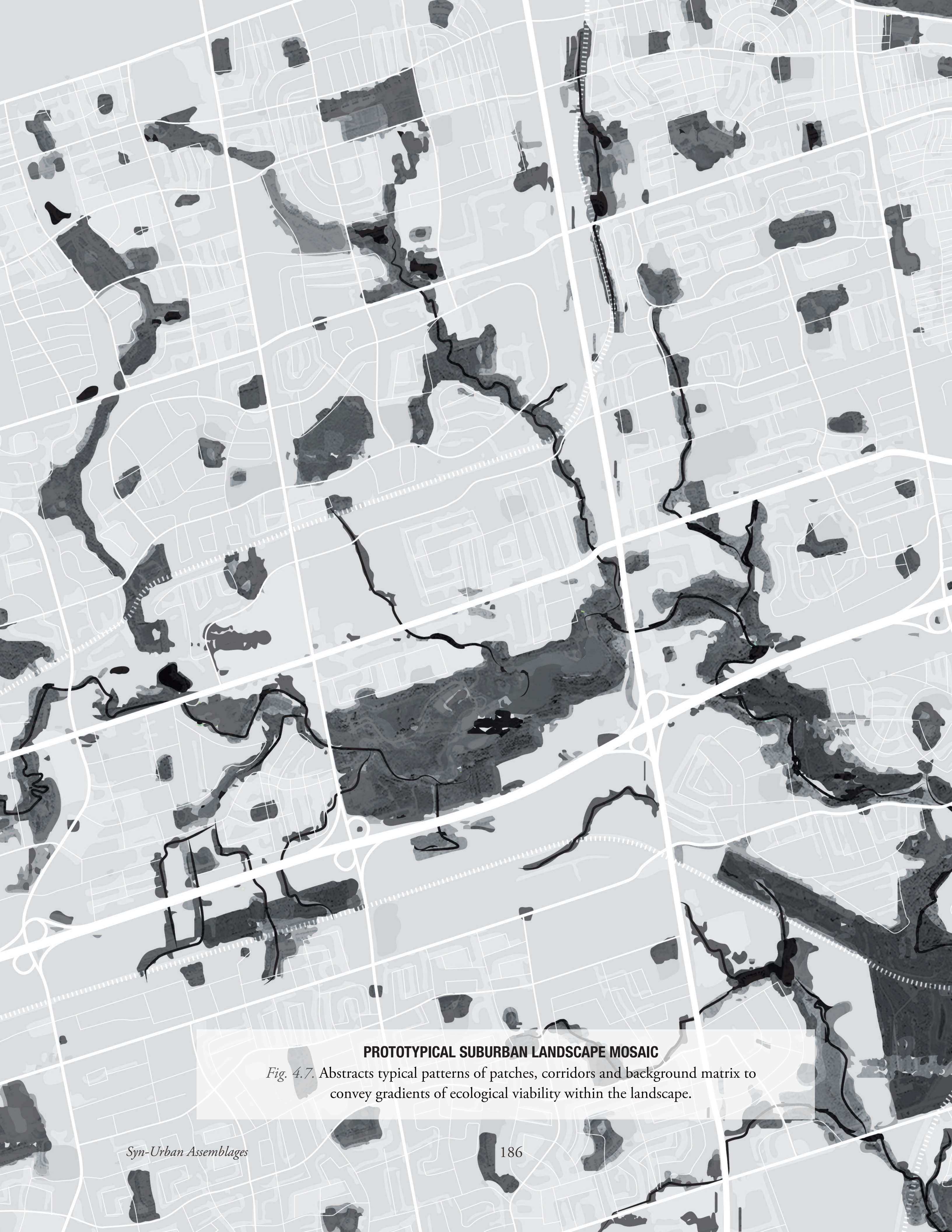


Fig. 4.4. Issue one: Conventional suburban fabric. Streets divide blocks, fragmenting the background matrix.

Fig. 4.5. Issue two: Intersection of human and animal vectors of movement.

Fig. 4.6. Issue three: Fragmentation of ecological patches caused by development.





PROTOTYPICAL SUBURBAN LANDSCAPE MOSAIC

Fig. 4.7. Abstracts typical patterns of patches, corridors and background matrix to convey gradients of ecological viability within the landscape.

therefore critical to improving the ecological quality of the suburban biome.

Architectural Control Guidelines

While the form, pattern and quality of the afforementioned components of landscape ecology, in principle, govern the viability of a landscape, Architectural Control Guidelines are used to structure the built environment. The use of Architectural Control Guidelines began in pre-war 1930s as a method for ensuring public welfare through physical, social and ecological planning of public amenities. Within contemporary development systems, the guidelines are used to harmonize and enhance the exterior presentation of homes and buildings with the general scheme of the civic design, including materials, colours, massing, styles, texture, scale, and landscaping.[5] Architectural Control Guidelines vary from city to city however, they can be distilled to three major objectives. The first is to maintain *Controlled Variation* by establishing a limited range of variations that together create a "harmonious appearance." The second is to include *Placemaking Features* such as chimneys, dormers and other unique architectural elements, to differentiate prominent lots with high visibility and featured areas within a community. Finally, the third is to develop *Healthy Communities* that function as safe and accessible neighbourhoods that maintain privacy between individuals while simultaneously fostering community engagement.

Architectural Control Guidelines prioritize aesthetic quality over performative in order to maintain a standard of appearance as prescribed a city or developer's market objectives. The thesis argues that design considerations must extend beyond aesthetic values to include ecological performance into the development of novel suburban landscapes. *Synanthropic Suburbia* appropriates and leverages Architectural Control Guidelines outlined by the city of Brampton, Ontario to support the implementation of the synanthropic prosthetics.

Synanthropic Suburbia seeks to understand how the implementation of the architectural scale prosthetics can influence the pattern and form of the community scale of the suburban landscape. The objective is to strategically fortify the background ecological matrix by providing available habitats and increased connectivity between existing patches and corridors. The individual implementation of each architecture scale prosthetic and associated zoning has minor influence on its local environment. However, the multiplication and accumulation of each system forms a synanthropic suburban assemblage. Using the Compost Chimney, Extended Eave and Habitat Dormer, the syn-urban assemblages establishe connectivity through a network of backyard corridors, creates viable habitat patches for targeted species, and ensures everyone, both non-human and human, has access to open space within their neighbourhood. The syn-urban assemblage negotiates the boundary between human and animal to create a vibrant social and ecological community.

The Compost Chimney is implemented as a *Placemaking Feature* which simultaneously fortifies the soil within the novel suburban ecosystem. Conventional fencing is replaced with the A*nimal Movement Corridor*, a continuous, vegetated space that provides privacy between properties and allows animals to circulate through the suburban block. As the vegetation in the corridor grows, supported by the composted soil, it expands to create a network which overtime changes the form of the suburban block. The objective is to fortify the background ecological matrix by creating habitat and foraging opportunities as well as greater circuity for animals.

The principles of the Extended Eave prosthetic are modified to create three variations, each of which support a different bird species and generate a distinct street frontage. A single type of Extended Eave prosthetic is deployed across a community-scale patch to establish a unique species based identity for a neighbourhood.

The Bat Wall system would be the first in an array of habitat providing cladding systems with which homeowners could customize their suburban house. The implementation of the Habitat Dormer is strategically limited to one per square kilometer in order to ensure the habitat viability for the barn owl while also creating a sense of novelty for human neighbours. Barn owls require open space for hunting therefore a park, storm water pond, school ground must be inserted into the network of movement orridors to provide shared outdoor space for humans and non-humans.

Through the implementation and multiplication of the prosthetics, potential spatial typologies emerge that shift priorities from aesthetic appearances of specific properties towards performative capacities of connected systems. *Animal Corridor Blocks* would have deeper properties to allow for a network of corridors to extend through backyards. The corridor network could replace stormwater ponds by integrating open channels that collect run-off from the road systems. Homeowners would gain additional land area and contribute to the hydrological and ecological performance of the neighbourhood. Suburban developers could establish *Patch Communities,* neighbourhoods which are environmentally distinct from the typical matrix. The unique, ecosystem-derived identity could be leveraged as a marketing tool to promote the diverse quality of the neighbourhood, distinguishing it from the typical homogeneity of the suburbs. The *Reduced-Footprint Single-Family House* could become the new standard in order to increase available permeable land area while also maintaining homeowners' desire for autonomy from their neighbours.

These new suburban typologies would become the synanthropic building blocks of the syn-urb. Additional prosthetics and synanthropic building materials could be developed that enable the homeowner to further customize their home and surrounding ecosystem. The exterior appearance of a house would correspond to the aesthetic preferences and species tolerance of the individual homeowner. Suburban communities would no longer be named after the landscapes they replaced, but for the future ecosystems they want to cultivate.

community-scale application

SYN-URBAN TYPOLOGIES

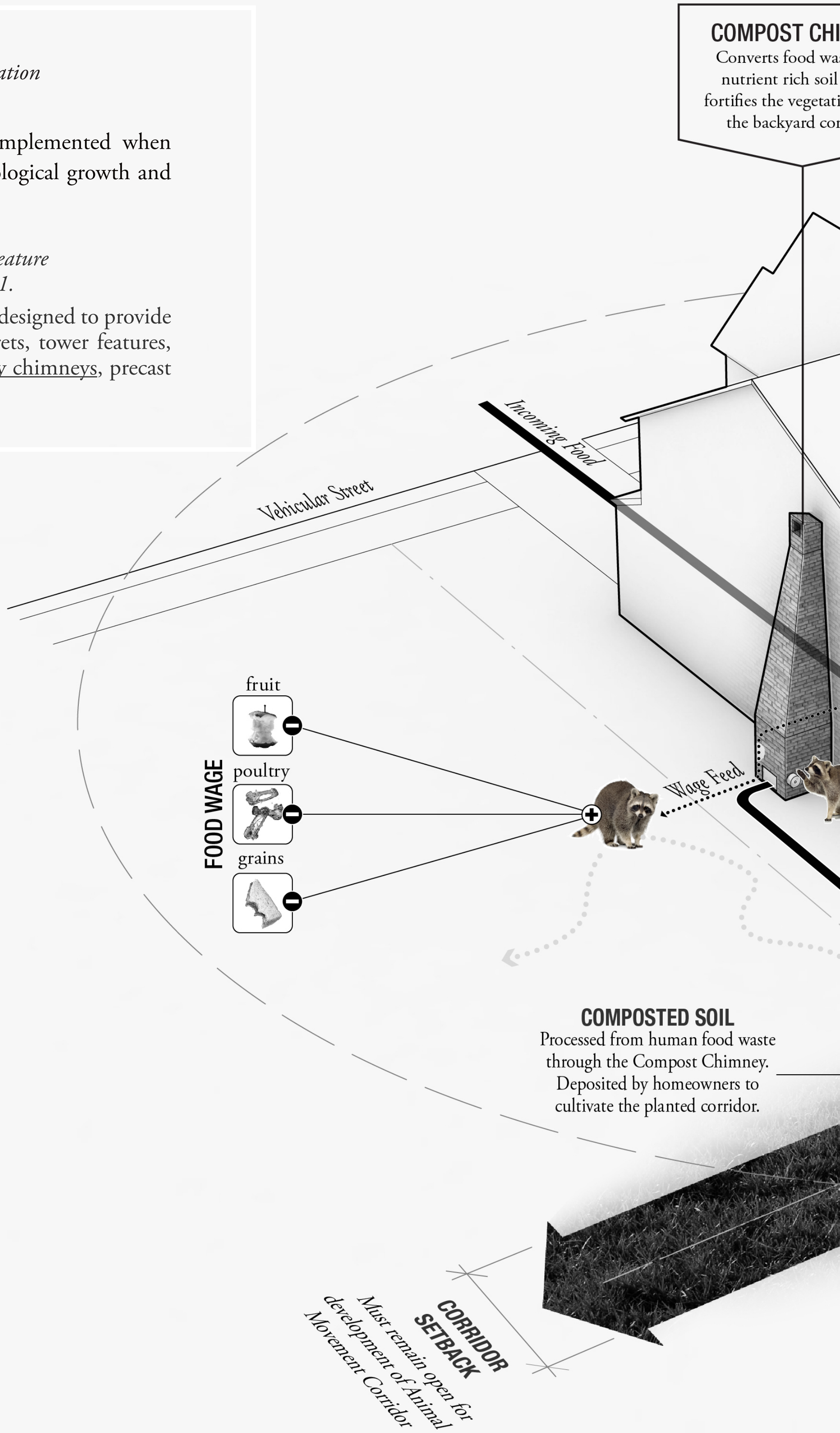
COMPOST CHIMNEY *Implementation*

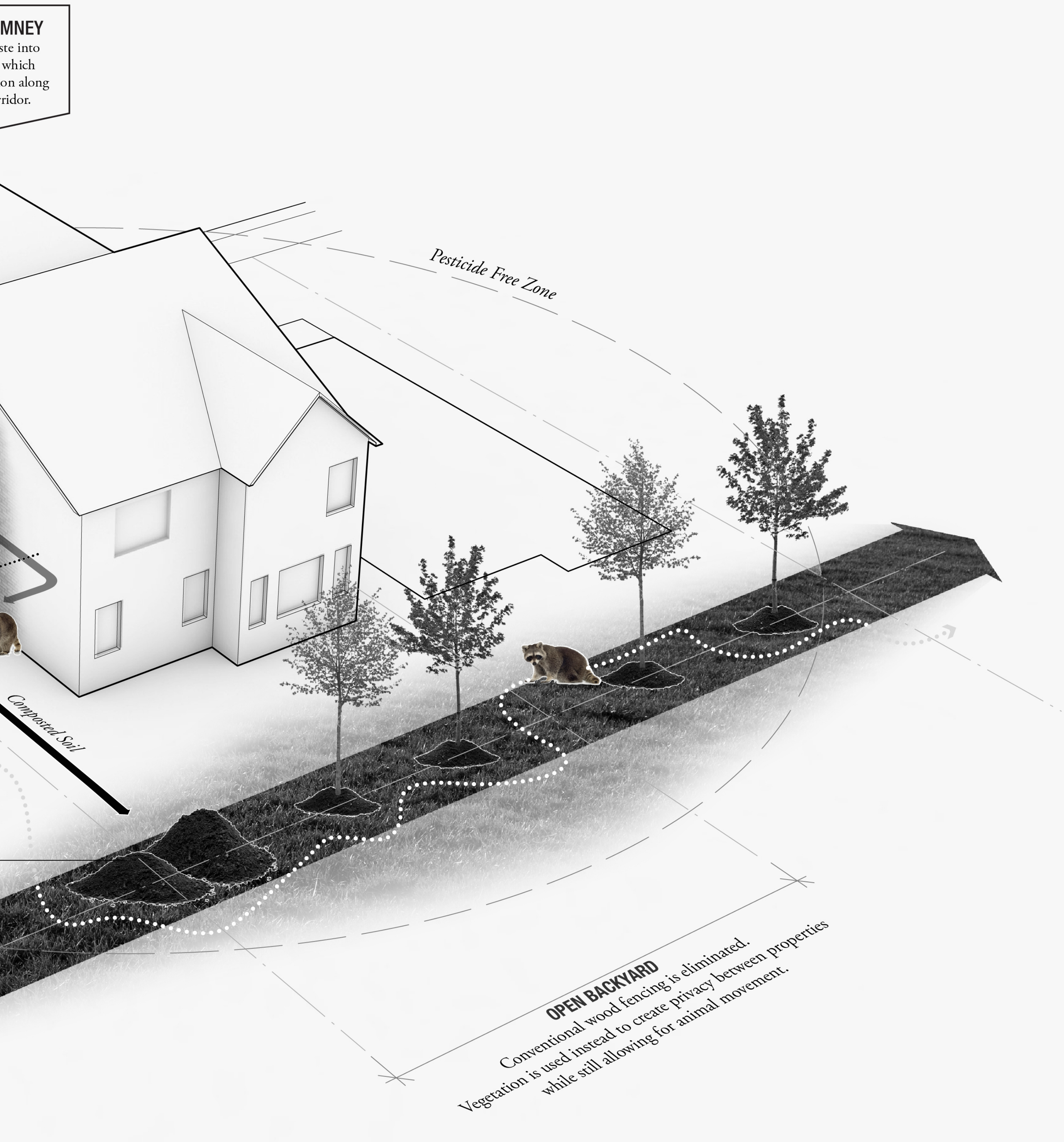
Fig. 4.8.

Compost Chimney and Corridor Setback implemented when suburb first developed to define space for ecological growth and initiate improvement of the soil

Architecture Control Guideline - Placemaking Feature
5.3 Community Gateway Dwellings, Guideline 1.

~~Community Gateway~~ **All** dwellings should be designed to provide distinctive architectural elements such as turrets, tower features, projecting bays, wraparound porches, <u>masonry chimneys</u>, precast detailing, shutters, and gables.




MNEY
ste into
which
on along
rridor.
Pesticide Free Zone
Composted Soil
OPEN BACKYARD
Conventional wood fencing is eliminated.
Vegetation is used instead to create privacy between properties
while still allowing for animal movement.

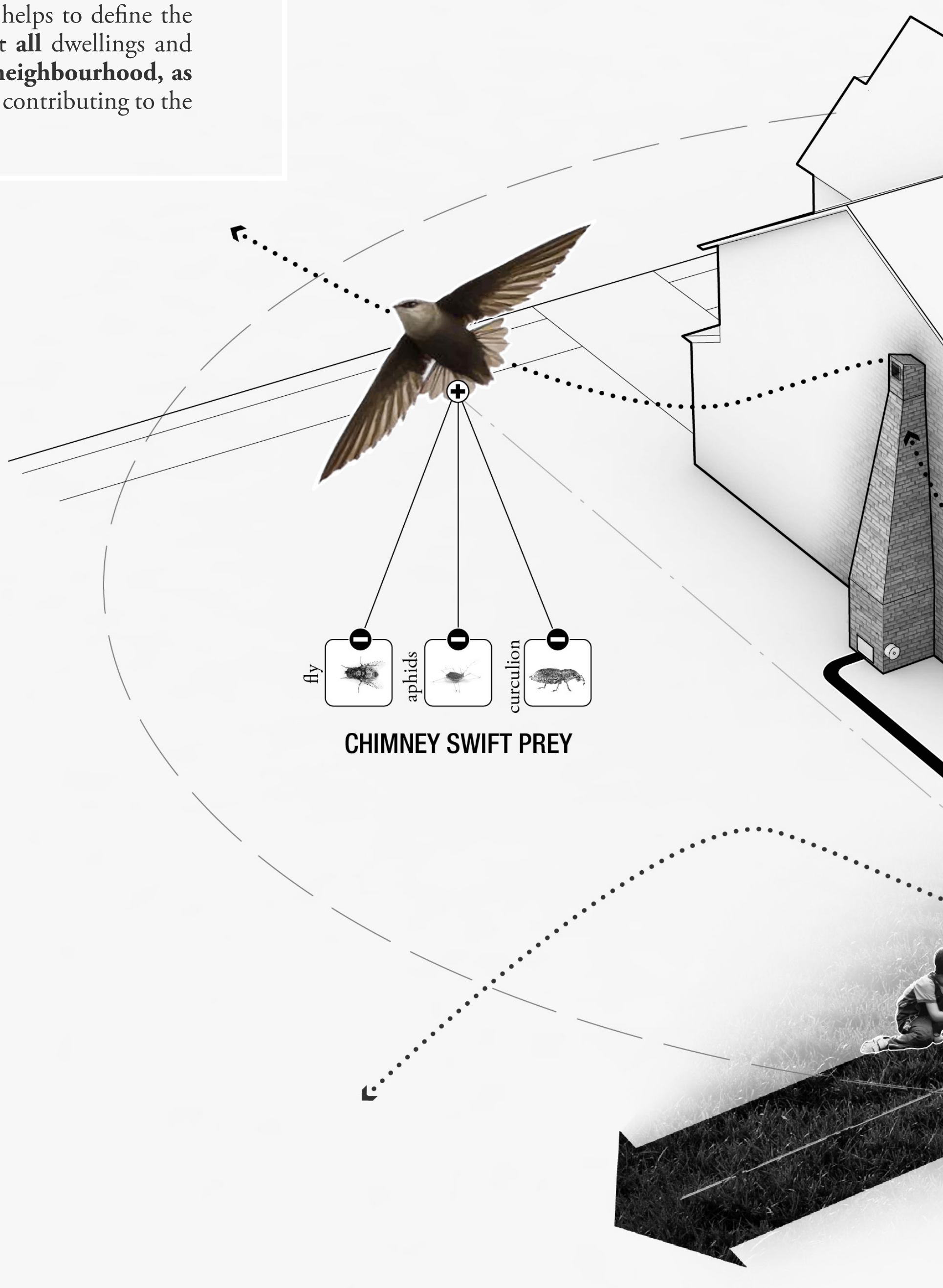
COMPOST CHIMNEY / *Cultivation*

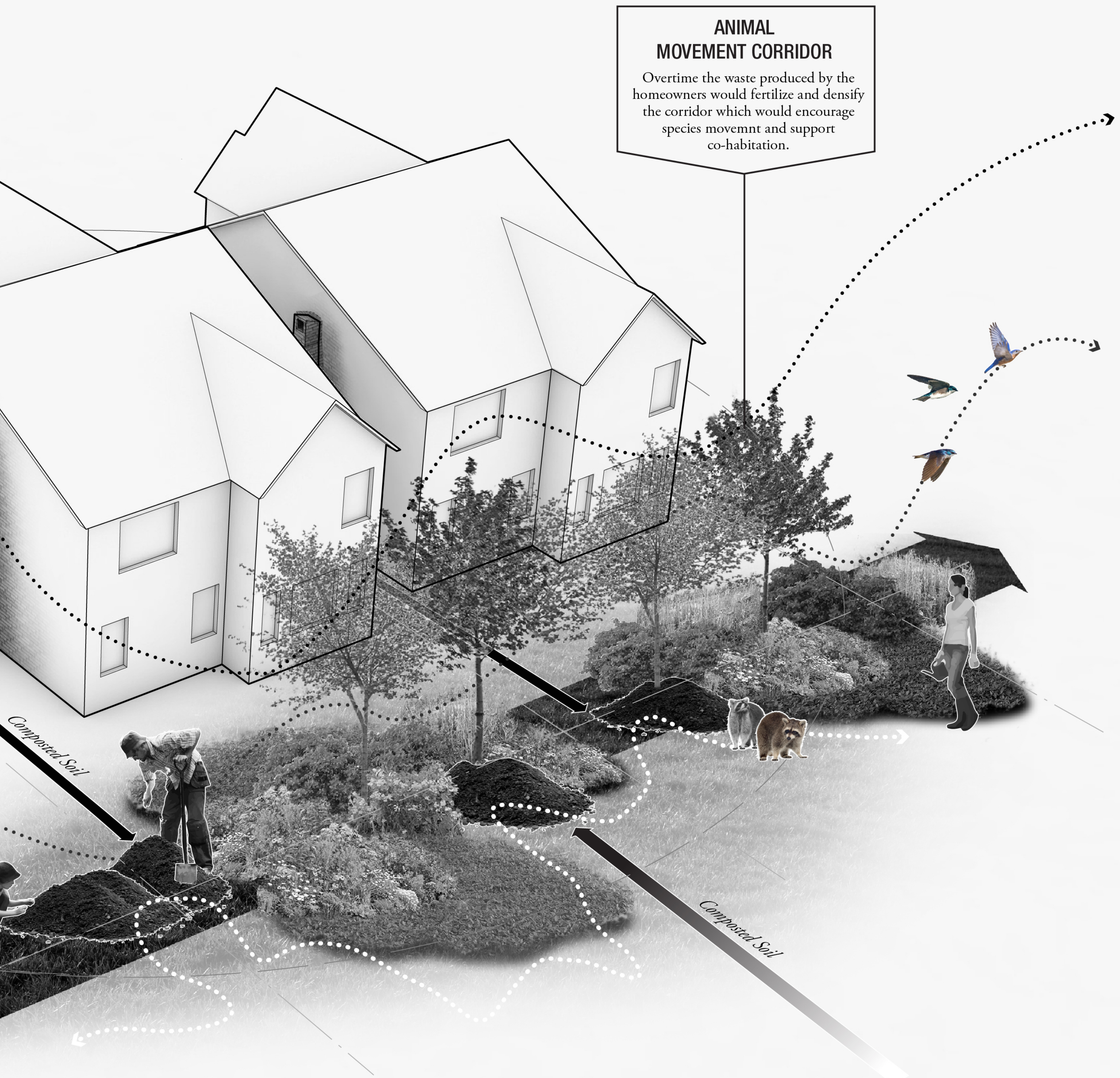
Fig. 4.9.

Overtime the waste produced by homeowners would be added to the corridor, improving the quality of the soil and allowing for the densification of the planting.

Architecture Control Guideline 2.5.

~~Fencing~~ **The animal Connectivity Corridor** helps to define the private rear yard amenity space for ~~corner lot~~ **all** dwellings and **enables species movement throughout the neighbourhood, as well as** assists in establishing sense of place and contributing to the character of the community.




ANIMAL
MOVEMENT CORRIDOR
Overtime the waste produced by the homeowners would fertilize and densify the corridor which would encourage species movemnt and support co-habitation.
Composted Soil
Composted Soil

ANIMAL MOVEMENT BLOCK / *Extension & Division*

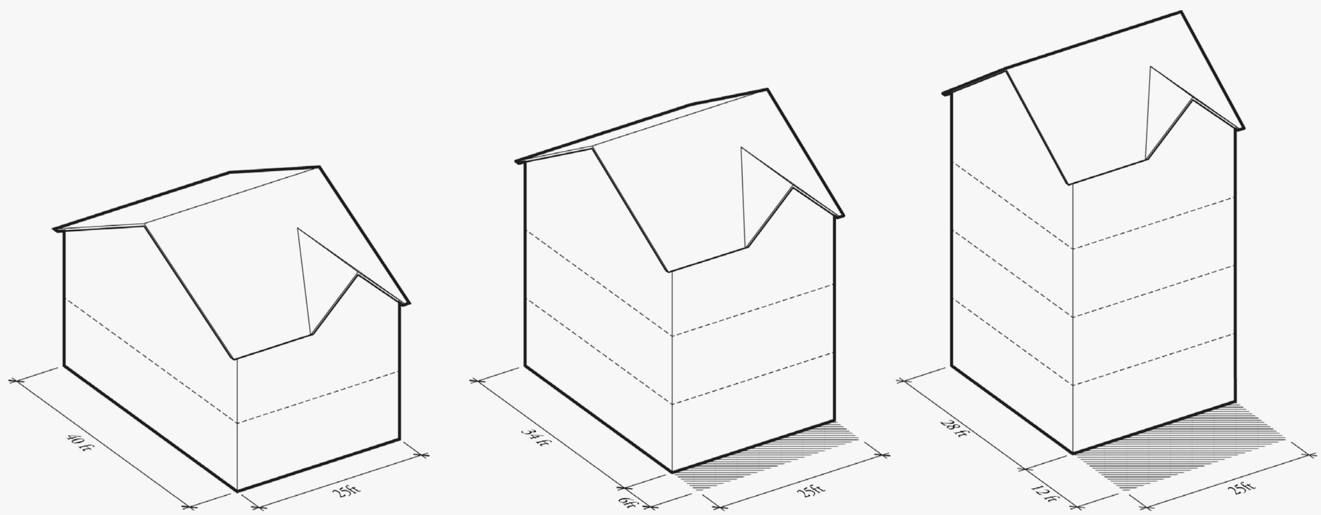
Fig. 4.10.

When replicated across the block, the connectivity corridor produces a path of circulation for non-humans. Homeowners seeking privacy begin to extend the planting from the central corridor to create a lateral barrier between backyards.

ANIMAL MOVEMENT BLOCK / *Densification Incentives*

Fig. 4.11.

To encourage the densification of the corridor, homeowners are offered incentives to reduce their building footprint. For every 15% reduction in building footprint area, homeowners are able to add one additional storey and increase their overall square footage.



Building Footprint: 1000 sqft
Total Square Footage: 2000 sqft

Building Footprint: 850 sqft
Total Square Footage: 2550 sqft

Building Footprint: 700 sqft
Total Square Footage: 2800 sqft

ANIMAL MOVEMENT BLOCK / *Network Connections*
Fig. 4.12.

The central animal Connectivity Corridors combined with the transverse paths form a mesh of circulation throughout the background suburban matrix. The matrix supports animal movement, foraging, and inhabitation throughout the landscape.


DENSIFICATION
Homeowners are incentivised to reduce their building footprint and in exchange are allowed additional storeys and sqft.

Fig. 4.13. Backyard Animal Movement Corridor on a summer evening.

BIRDBATH EAVE / *Bluebird & Tree Swallow*

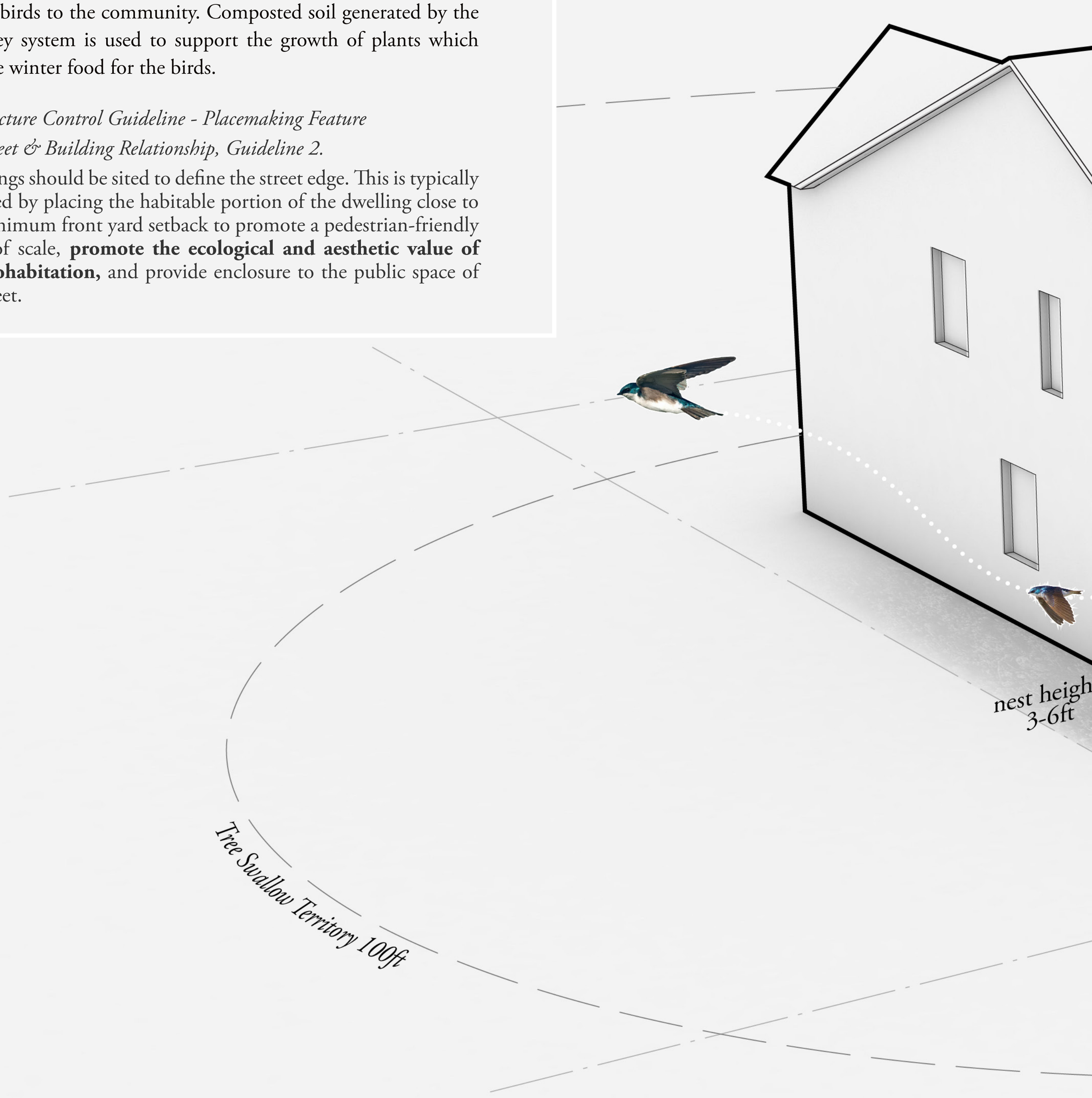
Fig. 4.14.

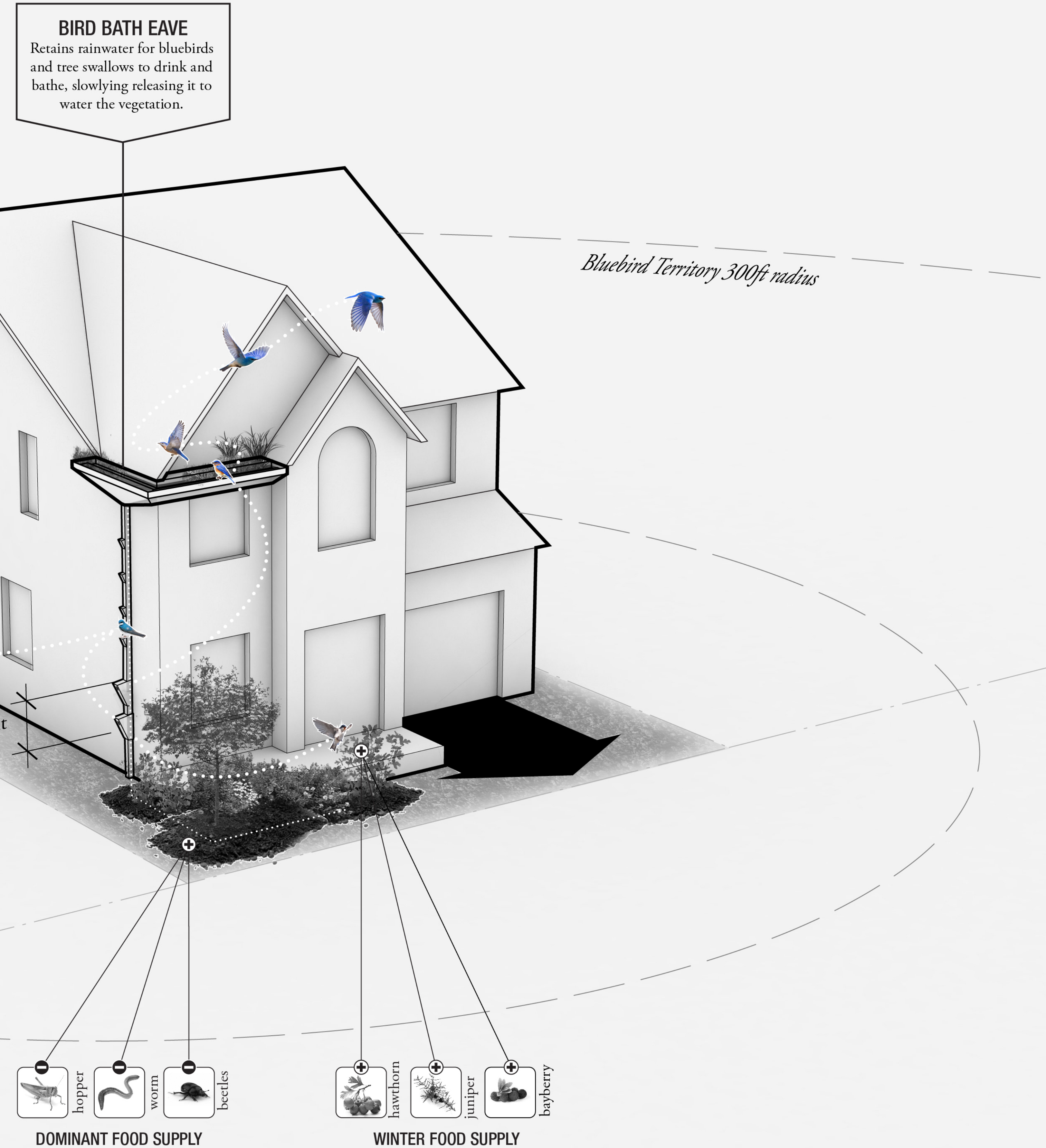
The house is situated closer to the street to promote the presence of bluebirds to the community. Composted soil generated by the chimney system is used to support the growth of plants which provide winter food for the birds.

Architecture Control Guideline - Placemaking Feature

2.2 Street & Building Relationship, Guideline 2.

Dwellings should be sited to define the street edge. This is typically achieved by placing the habitable portion of the dwelling close to the minimum front yard setback to promote a pedestrian-friendly senes of scale, **promote the ecological and aesthetic value of bird cohabitation,** and provide enclosure to the public space of the street.




BIRD BATH EAVE
Retains rainwater for bluebirds and tree swallows to drink and bathe, slowlying releasing it to water the vegetation.
Bluebird Territory 300ft radius
hopper
worm
beetles
hawthorn
juniper
bayberry
DOMINANT FOOD SUPPLY
WINTER FOOD SUPPLY

EXTENDED PLANTER / *Goldfinch*

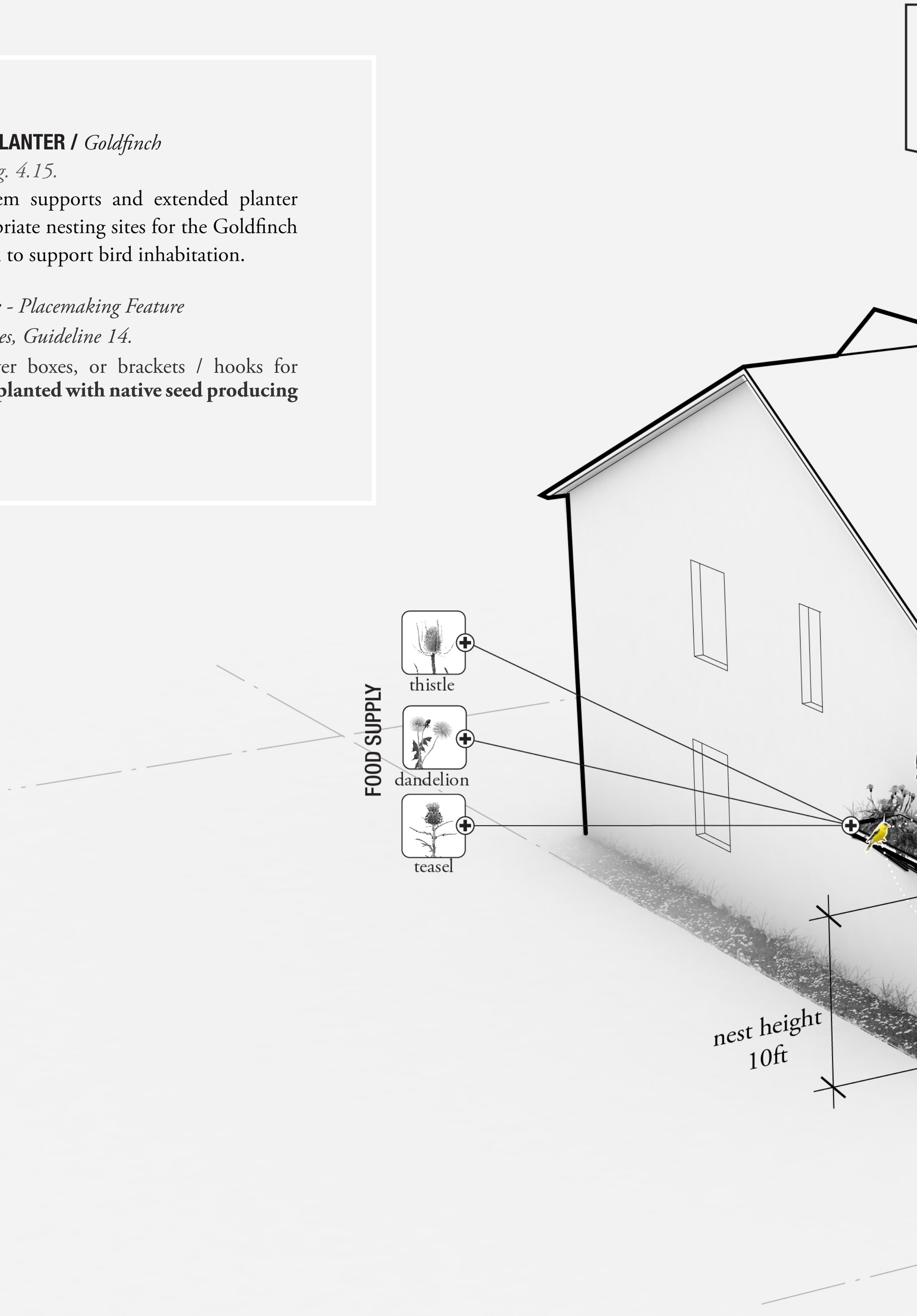
Fig. 4.15.

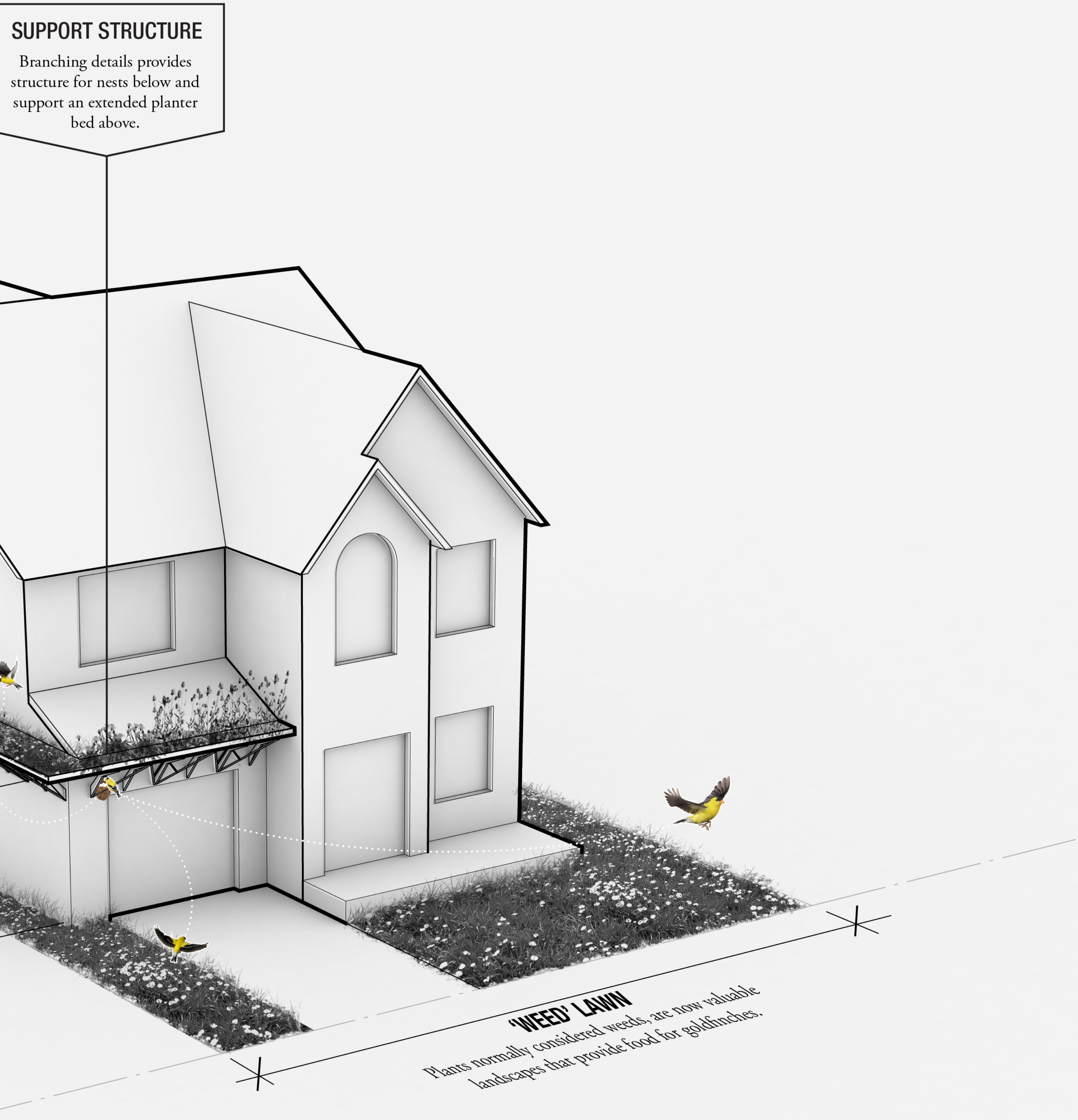
A branching structural system supports and extended planter above while providing appropriate nesting sites for the Goldfinch until the trees mature enough to support bird inhabitation.

Architecture Control Guideline - Placemaking Feature

3.6 Porches / Porticos / Balconies, Guideline 14.

Provision of integrated flower boxes, or brackets / hooks for hanging pots **which are then planted with native seed producing vegetated** are encouraged.




SUPPORT STRUCTURE
Branching details provides structure for nests below and support an extended planter bed above.
'WEED' LAWN
Plants normally considered weeds, are now valuable landscapes that provide food for goldfinches.

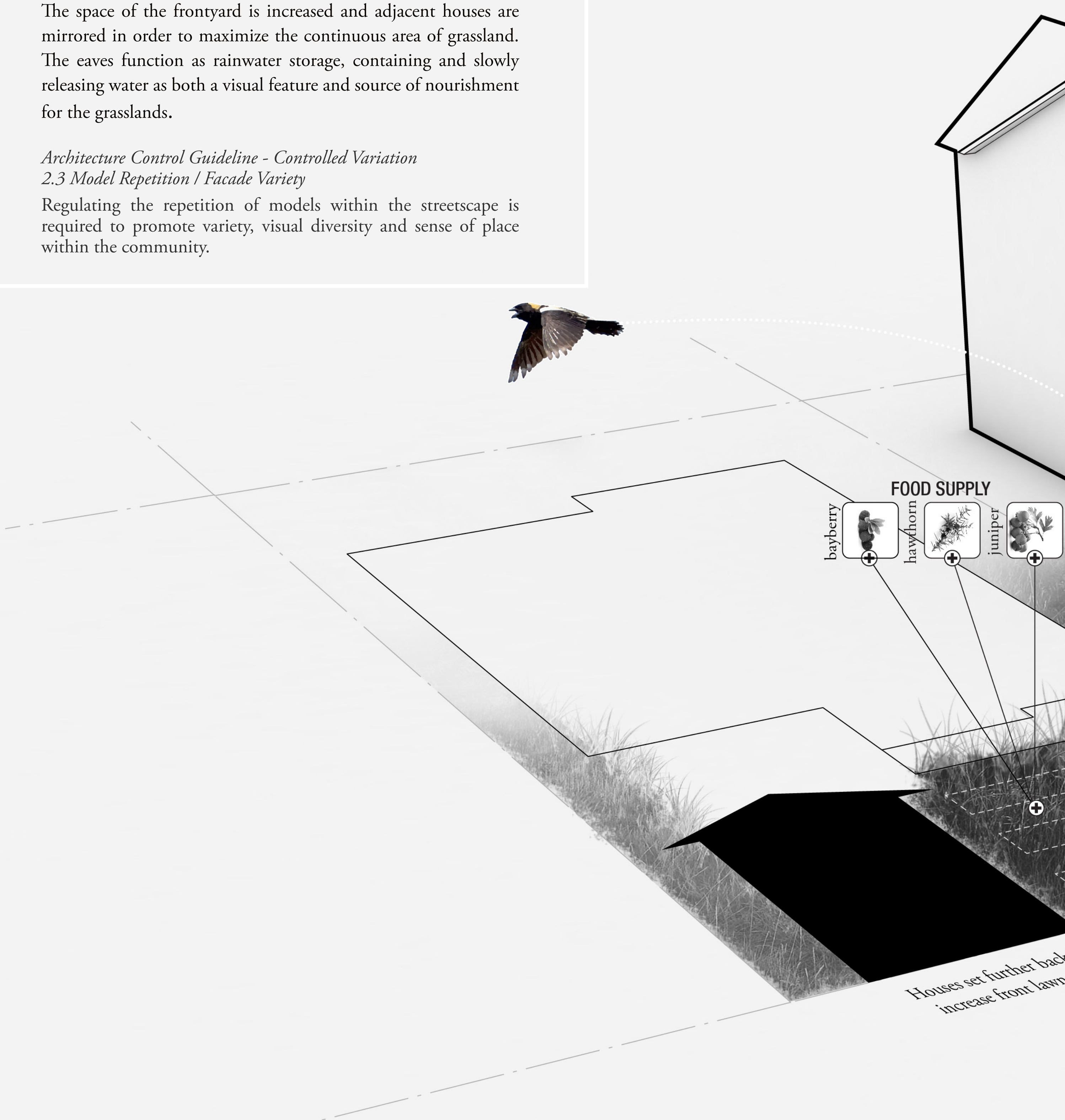
RAINWATER STORAGE / *Bobolink*

Fig. 4.16.

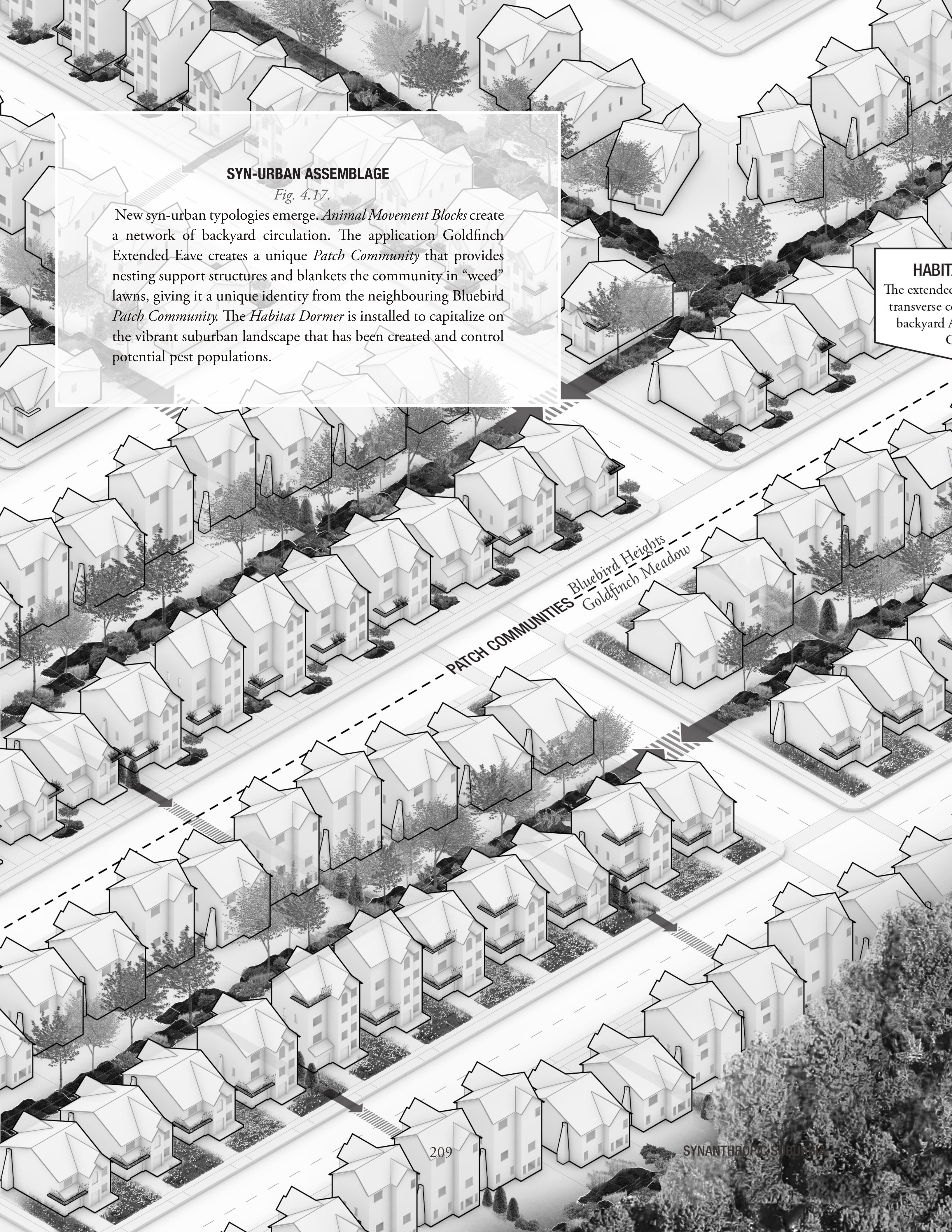
The space of the frontyard is increased and adjacent houses are mirrored in order to maximize the continuous area of grassland. The eaves function as rainwater storage, containing and slowly releasing water as both a visual feature and source of nourishment for the grasslands.

Architecture Control Guideline - Controlled Variation
2.3 Model Repetition / Facade Variety

Regulating the repetition of models within the streetscape is required to promote variety, visual diversity and sense of place within the community.




RAINWATER STORAGE
Extended Eave collects and stores rainwater from the roof which is used to gradually irrigate the front yard grassland.
FRONT YARD GRASSLANDS
Provides foraging and nesting area



SYN-URBAN ASSEMBLAGE

Fig. 4.17.

New syn-urban typologies emerge. *Animal Movement Blocks* create a network of backyard circulation. The application Goldfinch Extended Eave creates a unique *Patch Community* that provides nesting support structures and blankets the community in “weed” lawns, giving it a unique identity from the neighbouring Bluebird *Patch Community.* The *Habitat Dormer* is installed to capitalize on the vibrant suburban landscape that has been created and control potential pest populations.


AT DORMER
d vegetation provides
onnections between
Animal Movement
Corridors.
ECOLOGICAL SYSTEM
Animal Movement Corridors
connect into the existing
network of corridors and
patches.

part five

TERRITORIAL SYNURBIZATION

Across Scales

The methodology of the thesis explores the interrelationship between scales of design and ecology. Beginning at the architectural scale, the synanthropic prosthetics modify the physical limits of the house and in doing so, shift the conceptual territory of the homeowner. Birds are invited to occupy the periphery of the house; raccoons are engaged in routine chores, and barn owls are given prominent positions within the community. The relationship between human and animals is given new physical definition that is neither domestic, nor wild. At the community scale, the implementation and multiplication of the prosthetic systems assemble to form new typologies which are designed to support the foraging needs, habitat requirements and movement patterns of a species. However, to ensure the sustained health of a population and create a viable habitat it is critical to consider the meta-population dynamics, biological requirements and movement patterns of an animal at the territorial scale.

Suburbanization as Reconciliation

The outward expansion of cities through the conversion of pre-existing landscapes into suburban developments is inevitable. However, the suburban development process presents an opportunity to expand synanthropic design to a territorial scale. Synanthropric Suburbia posits that anthropogenic transformation does not have to equate destruction but could, in fact, improve the landscape ecology of a territory.

The process of transformation begins as land developers purchase several smaller parcels of agricultural land and amalgamate them into significant areas which are then slated for suburban development. This process of accumulating land under a single entity presents a rare situation in which an entire novel ecosystem could be holistically developed. Instead of piecemeal transformations that each pursue independent objectives, suburban developments could fortify pre-existing ecological systems and establish new habitat opportunities not present in the previous background ecological matrix.

Conventional animal conservation practices utilize a similar process. By gaining control over large tracts of land, conservationists create and control protected parks which are critical to providing habitat and foraging opportunities for targeted species. Often these animal preserves are located in remote regions and human access is deliberately restricted. Reconciliation ecology argues that these restricted zones are not enough to protect the earth's remaining biodiversity.[1] Michael Rosenzweig posits in his book *Win-Win Ecology* that conservation can occur everywhere if animals are integrated into human occupied landscapes. Therefore, embedding non-human parameters into the suburbanization process could act as a form of ecological reconciliation. Synanthropic suburbs could provide opportunities not only for human domesticity but also, animal inhabitation.

Structuring Development

Within southwestern Ontario and more specifically, the Greater Toronto Area, the development process is used to convert agricultural fields into new suburban landscapes. The existing landscapes of row crop growth are often interspersed with forested areas, ravines, and ponds that provide important ecological functions for the ecosystem and the species who inhabit it. Therefore the conversion of the dominant matrix from agricultural to suburban must act to protect these existing ecological systems, but what if it could provide new opportunities for non-human species?

def'n . ecological function
the natural processes, products or services that living and non-living environments provide or perform within or between species, ecosystems and landscapes. These may include biological, physical and socio-economic interactions

The process of land use conversion and development is governed at the broadest level by legislated planning acts such as the Places to Grow Act and Ontario Greenbelt Act which were both established by the Ontario government in 2005. These political frameworks allow the provincial government to determine where landscape transformation can and cannot occur within Ontario. Official city plans further determine the priorities, shape, quality and location of developments within and at the edges of cities. These extensive documents typically include detailed zoning by-laws, and are used to determine spatial, economic, infrastructural and even ecological objectives of a city.

Synanthropic Suburbia speculates that these planning structures could be modified and leveraged to promote the development of syn-urban neighbourhoods. In order to progress towards animal-inclusive communities, top-down legislature needs to relinquish the concept that the natural environment can only be preserved, and instead embrace that humans have the capacity to design and construct entirely new and ecologically valuable ecosystems. Development acts could then engage issues of animal subjectivity and inclusivity into the development of urban environment. Official city plans could target priority ecological areas within future developments in order to strategically improve territorial connectivity and habitat quality.

Animal migration routes, home range requirements and seasonal patterns, could inform the spatial planning of communities creating a land mosaic that supports a wider range of non-human species.

The thesis explores these assumptions through application onto Upper Unionville in Markham, Ontario. The objective is to improve the quality, connectivity and opportunities for non-human species by leveraging the official plan to support the development of a synanthropic suburb. The City of Markham's Official Plan promotes the protection and enhancement of the ecological, hydrological and agricultural areas which comprise the "Greenway System" that covers 33% of its land area.

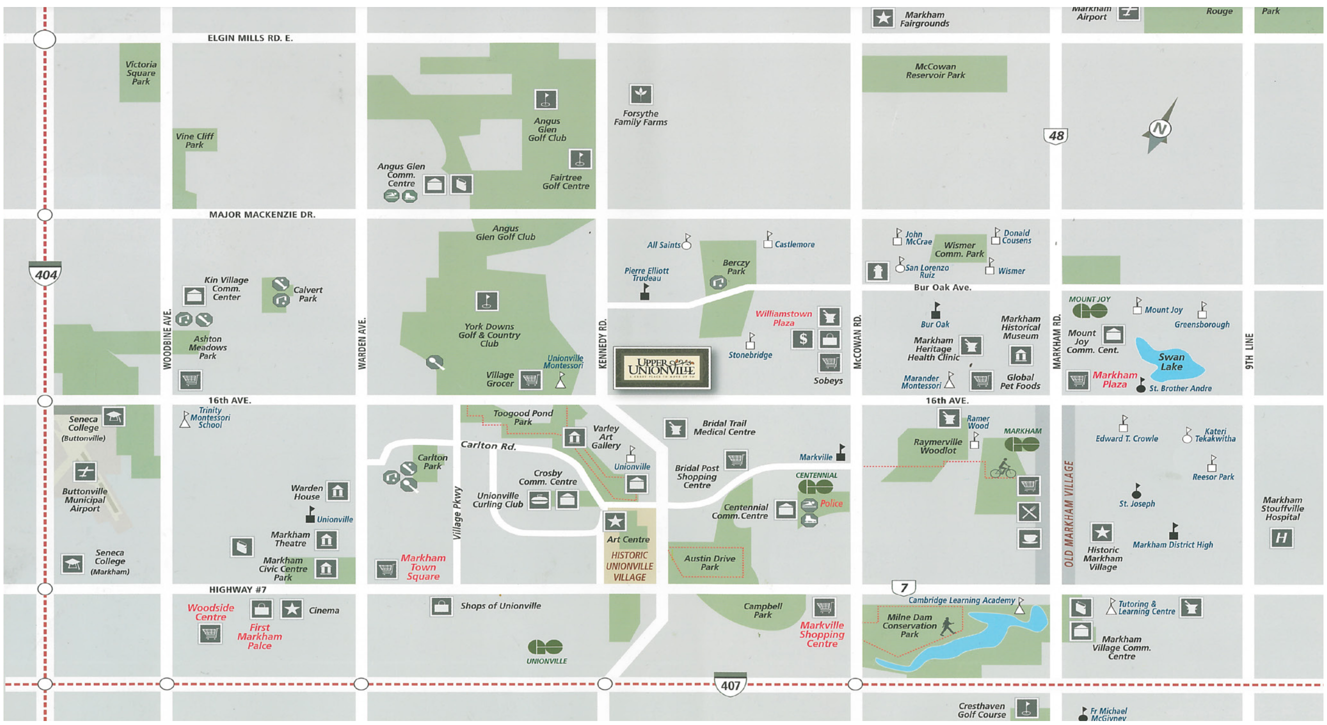


Fig. 5.1. Upper Unionville Community Amenity Plan.

The purpose of the Greenway System policies is to maintain and enhance, as a permanent landscape, an interconnected system of natural open space, agricultural lands and enhancement areas and linkages that will preserve areas of significant ecological value and protect agricultural lands while providing, where appropriate, opportunities to improve biodiversity and connectivity of natural features and ecological function.[2]

The objectives of Markham's official plan acknowledge the value of the landscape ecology of the area—the corridors, vegetation patches, and overall connectivity. However, the document uses normative language to prescribe environmentally-minded objectives and does not provide methods through which they can be accomplished. Furthermore, it prioritizes pre-existing systems without considering how anthropogenic development could also support new biological life.

The redevelopment of Upper Unionville into a synanthropic suburb requires a restructuring of the city's objectives to protect the greenway system. In order to fortify the ecological system and create new opportunities, new spatial patterns are employed that blur the land use boundary which typically divides 'greenway' from 'suburb'.

The objective of synanthropic design at the territorial scale is to fortify the existing ecological systems; improve the quality and connectivity of the background ecological matrix; and create new opportunities through the development of diverse habitat patches. The synanthropic prosthetics and syn-urban typologies developed at the smaller scales are strategically applied to Markham's prototypical suburban landscape to generate gradients of ecological resistance and viability. Three general strategies are developed which protect the existing greenway system, improve overall circuity, increase available habitats and together establish a syn-urban community. The process could be used to guide new development or influence the redevelopment of existing suburban communities.

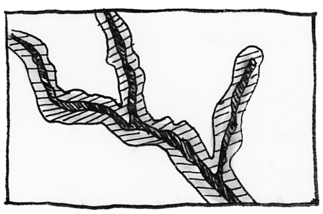


Fig. 5.2. Strategy one: Syn-urban Zone offset from existing ecological systems.

The first strategy is to modify the city plan by adding a second conceptual boundary, offset from the existing Greenway System which defines a *Syn-urban Zone.* Suburban blocks within this boundary are ecologically appropriated as part of the Greenway System, forming a hybrid landscape. The Compost Chimney is deployed onto every house within the Syn-urban Zone. The transition from greenbins to the composting prosthetic reduces unmitigated foraging by raccoons which is a nuisance for any homeowner. Instead, the nocturnal animal is engaged in the production of nutrient rich composted soil which is used to enrich the ecological potential of the properties. Homeowners are encouraged by the revised Architectural Control Guidelines to cultivate local plants which support present and targeted animal species. Through these efforts, the edge condition of the ecological corridor is allowed to expand into the adjacent properties.

Within new syn-urban developments, future homeowners who are considering property along the Syn-urban Zone are required to purchase *Reduced-Footprint Single-Family Houses* in order to maximize the available land adjacent to the Greenway System. In existing neighbourhoods, homeowners who own property within the boundary are incentivized to renovate and create additions vertically instead of laterally. All properties would remain under private ownership but would become an ecological extension of the Greenway System. Homeowners therefore become stewards of their own backyard ecosystem and contribute to the fortification of the existing ecological systems. Overtime the boundary of the Syn-urban Zone could be expanded to include additional suburban blocks, engaging additional properties and homeowners in the cultivation of their syn-urban community.

To take advantage of the ecologically enriched Syn-urban Zone, additional prosthetics could be deployed. The thickened edge condition would be an ideal location for a Habitat Dormer which supports barn owls. The expanded Greenway System would provide an ecological area, away from the lights and noise of roads, where the predatory bird could hunt for rodents and small mammals.

The second strategy adds to Greenway System by incorporating transverse corridors which increase the overall circuity of the network. The existing north-south corridors enable animal movement through the suburban matrix however lack interconnectivity between them. The *Animal Movement Block* typology developed in *Part Four: Syn-Urban Assemblage* is strategically deployed to link together parallel north-south corridors across the least distance. The form of the Animal Movement Blocks follow the typical patterns of suburban development, using the network of backyards to define the connecting corridor.

Within the Animal Movement Block, vegetation is used to replace conventional fence partitions and provide protection for animals and supplementary habitat opportunities. The Compost Chimney is once again deployed to support the ecological densification of the area. Homeowners begin to treat the backyard as a commons, shared between human and animal neighbours. The transverse connections created allow animals to circumnavigate the perils of the road network, gain access to greater territory, and connect to larger habitat patches. The corridors also serve as human access points to the larger pedestrian circulation of the Greenway System. The Animal Movement Blocks increase exposure and promote enjoyment of the entire ecological network and thereby embed the value of ecological considerations into suburban ideologies.

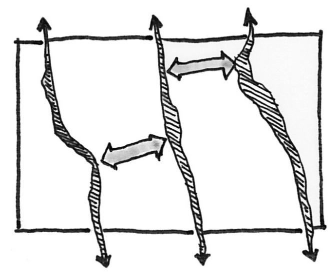


Fig. 5.3. Strategy two: Animal Movement Block creates transverse connections between existing corridors.

The third strategy defines *Patch Communities* which operate as stepping stones between larger patches. Each community is designed to provide habitat for a specific avian species through the use of an Extended Eave prosthetic. Targeted species and the community location are selected based on proximity to foraging patches such as parks, playgrounds, agricultural fields, commercial areas, and greenway corridors. For example, bluebird and tree swallow communities are developed around stormwater ponds which can support their insect-based diet but also provide open water for bathing and drinking. Goldfinches feed upon seeds produced by 'weed' plants. The Goldfinch Patch Communities are therefore situated in newly developed neighbourhoods or near unmaintained transit corridors where dandelions and other seed producing ruderals are prevalent. The bobolink is a ground nesting bird who finds shelter and food in tall grasses and grain fields therefore, they are located in close proximity to fallow land and agricultural fields. Robins are notorious ground foragers, often sighted pulling worms from green lawns. Habitats for these classic birds are created near large open parks and school grounds. Patch Communities for pigeons, sparrows and other discarded grain foraging birds are located near sporting fields or commercial centers, anywhere with outdoor

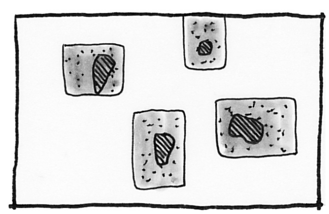


Fig. 5.4. Strategy three: Patch Communities develop around existing patches that support the habitat requirements of the species.

def'n . ruderal
a plant which is first to colonize highly disturbed soil such as a newly constructed suburb

cafes and restaurants. New Extend Eave prosthetics could be developed to target and support different bird species based on the ecosystem. Major roads and typical suburban patterns of development combined with the homerange of a species are used to define the shape of the patches. The architectural form of the prosthetic, the associated landscape and the activities of the species create unique identities for each of the Patch Communities, differentiating them both ecologically and architecturally from the surrounding matrix.

Together, the three strategies and their constituent parts, assemble to establish gradients of ecological viability. The transverse Animal Movement Blocks and thickened Syn-urban Zone combine to protect and enhance the existing Greenway System. The non-human and human pedestrian corridors circumvent transportation vectors such as roads and highways to increase the overall circuity of the network. Patch Communities create new habitat opportunities and visual identities within the suburban landscape. The strategies of territorial synurbization combine to improve the capacity of the background ecological matrix to support human and non-human cohabitation.

SECTION TITLE

Fig. 5.5. Synanthropic Suburban Landscape Ecology.


TREE SWALLOW WAY
patch: pond
BLUEBIRD POND
patch: stormwater catchment
SVERSE
NECTION
Corridor Block
existing corridors
SYN-URBAN ZONE
Extended boundary, thickening the existing ecological system.
PIGEON PARK
patch: fast food restaurants
ROBIN HILL
patch: parks and school grounds
LEGEND
Syn-urban Zone
Transverse Connection
Patch Community
Background Ecological Matrix
Patch & Corridor of varying quality
Water Source

CONCLUSION

I began the thesis process in pursuit of my own position. Without particular site or specific issues to address, I was able to pursue the interconnectivity between architecture and ecology without contextual burden. Through research, I encountered the term synanthropic which became a catalyst for the thesis that followed.

Embracing the animal enabled me to look at the relationship between architecture and ecology through new eyes; to observe human behaviours, cultural values, and spatial patterns from a posthuman perspective. Contemplating the animal-world became a surrogate for considering the human experience of the built environment. Issues of access, diversity, density, and circulation are interchangeable between human and non-human. The ability to procure food, migrate through landscapes, and secure shelter are fundamental to all beings.

Designing for and with the animal compelled the work to engage the non-human as an active subject. The objective as an architect was to contemplate all facets of a synanthropic species and engage, through design, the broader biological attributes and cultural values that come with living alongside animals. The fundamental question pursued was, how can architecture incorporate habitat support into architectural form and landscape systems? At a broad scale, I was interested in how the small can impact the large, a question which ultimately governed the methodology of the thesis.

Multi-Scale Methodology

The methodology of *Synanthropic Suburbia* inverted conventional approaches to questions of scale which typically begin with large, territorial analysis and zoom-in towards regional, then architectural scales. Instead, I first contemplated the small-scale of the animal subject, then progressed outwards to the community-scale, eventually expanding in scope to the suburban landscape-scale. The objective was to explore domestic architecture's potential to influence the quality of the suburban environment.

The species parameter drawings therefore became fundamental tools in each of the subsequent design experiments. Each parameter drawing analyzed and compiled local relationships, spatial conditions, and movement patterns of the six selected species. In reflecting upon these drawings, it is evident that while they succeed at communicating the individual actions and interactions of a particular animal, they ultimately neglect to incorporate large-scale considerations of meta-population dynamics, migration, and habitat viability. I believe this is reflective of the methodology's sequential transition from small to large-scales of operation which ultimately produced a somewhat myopic perspective that limited the simultaneous consideration of multiple scales.

Small-scale prosthetics were then derived from the species parameter drawings which, in a way, served as a conceptual diagram for each design. The form, scale, and designed interactions were intentionally subtle, hoping to find traction as a plausible future within the conventional expectations of the American Dream. However, the limited scale of the design was also a product of a larger ambition to fabricate the interventions at 1:1 scale and to implement them within the urban environment. The objective was to test their ecological viability by installing the prosthetics and monitoring their evolution, establishing a feedback loop that would inform further design iterations. Alexander Felson of the Urban Ecology Design Lab at Yale University, defines this process as Designed Experiments, projects which embed ecological thinking into urban design and create feedback loops through monitoring and further experimentation. I believe that the design of ecological architecture is not a finished product, but an ongoing process that necessitates careful observation and subsequent modifications in order to identify and respond to the dynamic factors of an ecosystem.

However, to successfully generate a feed-back loop requires a significant period of time during which the designed experiments must be closely monitored. In reflecting upon my own designed experiments, I believe that in order to improve the process, the prototypes needed to be implemented for a longer duration and more intensively documented. For example, the Bat Wall prototype was implemented at the end of May and removed late August. During that period, I visited four times—typically in the late afternoon, early evening—to document the prototype through photography. Over the course of the three month period the Bat Wall became home to a few spiders however it did not attract the larger avian species it targeted. If I were to revisit the same process, firstly I would have implemented the prototype in early spring, as bats emerge from hibernation and migratory birds return to nest. This would have increased the likelihood of inhabitation by both bats and birds. Secondly, I would have documented the prosthetic more frequently and at various times of day to monitor if and how species interact with it. Finally, I would have expanded the scope of the project to create two additional segments of the Bat Wall and installed one in a mature suburban neighbourhood, and the other in a naturally occurring habitat. The objective would be to test how the wider ecological context influences interaction with and inhabitation of the architectural intervention. Comparing the viability of one site to another would have provided insight into the habitat characteristics required at the community-scale in order to establish successful cohabitation.

The subsequent process of defining critical spatial patterns at the community scale, proved challenging due to the highly specific, even narrow-sighted, focus of the small-scale architectural prosthetics. Initial attempts at developing strategies for synanthropic suburban communities lacked a critical position about the potential for new spatial patterns. While I was able to apply the prosthetic and the local species parameters to the scale of the single-family house, what was absent was a consideration of the territorial factors—such as migration and access to food sources—which influence the viability of a habitat. Land Mosiacs: The Ecology of Landscapes and Regions by Richard Forman was critical to this process, as it taught me the principles of landscape ecology which I later translated to the suburbs. Integrating the small-scale species parameters within the territory-scale context of spatial patterns and ecological systems enabled the multiplication, aggregation and expansion of the prosthetics into new synanthropic typologies at the community-scale.
The initial methodology defined a linear design process which transitioned from architectural, to community, to territory scale interventions, however, the thesis development ultimately required thinking across multiple scales simultaneously. For example, through the design process at the community-scale, I gained broader perspectives which augmented and improved the initial synanthropic prosthetics. The value of the Compost Chimney as a device for fortifying the soil in recently transformed suburban landscapes emerged through the development of the community-scale strategies. As a result, what was initially conceived of as an architectural feature for highly visible lots became an asset to every suburban homeowner and the ecosystem at large. Alternatively, applying the community-scale strategies to a prototypical suburban landscape influenced the siting established by the Synurban typologies and the systems defined by the architectural prosthetics. For example, when considered at the territory-scale, the Extended Eave had the potential to establish a community identity when deployed strategic habitat patches. This in turn motivated the design of multiple iterations of the Extended Eave at the architectural scale. What eventually emerged was a process of design, then application across multiple scales, that ultimately established an interconnectivity between architecture, community and territory systems within the thesis. This multi-scale approach initiated a feed-back loop that provided insight and critiques that enriched each of the initial concepts, reinforcing the necessity to think across scales in the design of ecological architecture.

Learning from this thesis process, I would approach questions of architecture, urbanism and ecology from the small, architectural-scale and the large territory-scale simultaneously. Researching both local species parameters and larger landscape conditions from the outset would establish a strong foundation and context within which to develop community-scale strategies. I believe that ecological architecture can have the greatest impact, for human and non-human inhabitants, at the scale of the community. It is within this realm that designers across the disciplines of architecture, urbanism, and landscape can establish ecological strategies which generate viable habitats within our anthropogenic environments.

Moving Forward

The series of design experiments integrated animal habitat into the built environment by affixing small-scale prosthetics onto a pervasive building typology, the suburban single-family house. Through this process I wanted to test the physical limits and conceptual boundaries of living with synanthropic animals in the suburbs. My objective was to simultaneously challenge the ideology of the American Dream and also reframe our non-human cohabitants within it. In a posthuman society, synanthropic design could blur the spatial definitions between human and animal to maximize the mutual benefit of cohabitating with non-human species. Eventually perceptions could shift to consider that, what is good for animals, is good for humans. Hybrid conditions of human-animal living could emerge, yet one question will always remain, how close is too close?

How can a synanthropic design thinking, which engages this interface between human and animal, be integrated into other forms of architectural practice? Could new guidelines such as Animal Aided Design developed by Dr. Thomas E. Hauck and Wolfgang W. Weisse,[3] or the Resource Guide for Bird-Friendly Building Design created by the Audobon Society[4] influence a new animal conscious architecture? What if building systems companies began to develop new standard cladding and structural materials that deliberately catered to the biological requirements of certain species? Entire buildings could be clad in rainscreen panels that provide occupiable cavities, shade structures could create nesting habitat, and exhaust systems could extended shoulder seasons for species. A new form of architectural practice could emerge that specializes in mediating the relationship between humans and animals through the design of synanthropic architectures.

The city–our built environment in general–is a form of nature. Within it, architecture delineates space, defining human desired qualities of atmosphere, spatial enclosure and cultural value. The animals who subsequently interact, even occupy, these spaces are not invaders but active citizens who perceive their environment through a different perspective. The shared urban environment therefore holds unique value for every being, human and otherwise. Architecture is part of a complex ecosystem of perceptions and actions, beings and systems. For me, architecture is no longer a human constructed, physical manifestation which distinguishes humans from the natural world. Instead, I believe that architecture is a constituent part of the global ecosystem, capable of positively impacting its local ecology through design.

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