



universität
wien

MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

verfasst von / submitted by

angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of

Master of Science (MSc)

Wien, / Vienna,

Studienkennzahl lt. Studienblatt /
degree programme code as it appears on
the student record sheet:

UA 066 664

Studienrichtung lt. Studienblatt /
degree programme as it appears on
the student record sheet:

Masterstudium DDP Urban Studies

Betreut von / Supervisor:

ABSTRACT

We are living in a time of extinctions and the biodiversity crisis is currently one of the biggest environmental challenges, threatening all life on our planet. At the same time, we are living in a time of rapid urbanisation: every day more people live in urban areas and these growing landscapes are changing our world in multiple, interrelated ways. The impact of urban areas on biodiversity is predominantly negative, but cities do offer also possibilities when it comes to biodiversity conservation. Wildlife gardening is one of the tools for urban biodiversity conservation engaging residents to create habitats and offer resources for non-human species in the city.

This research seeks to grasp the potential impact of these wildlife gardening actions done in urban gardens in the UK. It does so by analysing wildlife gardening guidance (documents and events) targeted to the general public and interviews with conservation specialists. This study will provide an understanding of the potential impact of wildlife gardening on different species groups and biodiversity root causes and draw an image of the dominant framings in motivating the residents to act.

Based on the analysis, it seems that the supposed purpose of wildlife gardening, direct conservation, has an important but rather limited potential. Instead, there is enormous potential in shifting awareness and supporting the reconnection with nature, which in turn can be considered as a deep leverage point and a prerequisite for real systemic change.

ABSTRACT

Wir leben in einer Zeit des Aussterbens und die Krise der biologischen Vielfalt ist derzeit eine der größten ökologischen Herausforderungen, die alles Leben auf unserem Planeten bedroht. Gleichzeitig leben wir in einer Zeit der raschen Urbanisierung: Jeden Tag leben mehr Menschen in städtischen Gebieten, und diese wachsenden Landschaften verändern unsere Welt auf vielfältige, miteinander verknüpfte Weise. Die Auswirkungen städtischer Gebiete auf die biologische Vielfalt sind überwiegend negativ, aber Städte bieten auch Möglichkeiten für die Erhaltung der biologischen Vielfalt. Das Gärtnern mit Wildtieren ist eines der Instrumente für die Erhaltung der biologischen Vielfalt in der Stadt, indem die Bewohner Lebensräume schaffen und Ressourcen für nichtmenschliche Arten in der Stadt anbieten.

Die vorliegende Studie versucht, die potenziellen Auswirkungen dieser Aktionen in städtischen Gärten im Vereinigten Königreich zu erfassen. Dies geschieht durch die Analyse von Leitfäden (Dokumente und Veranstaltungen), die sich an die breite Öffentlichkeit richten, sowie durch Interviews mit Naturschutzspezialisten. Diese Studie wird ein Verständnis für die potenziellen Auswirkungen des Gärtnerns mit Wildtieren auf verschiedene Artengruppen und die Ursachen der biologischen Vielfalt vermitteln und ein Bild der vorherrschenden Rahmenbedingungen zeichnen, die die Bewohner zum Handeln motivieren.

Aus der Analyse geht hervor, dass der vermeintliche Zweck des Wildlife Gardening, der direkte Naturschutz, ein wichtiges, aber eher begrenztes Potenzial hat. Stattdessen besteht ein enormes Potenzial in der Bewusstseinsveränderung und der Unterstützung der Wiederverbundenheit mit der Natur, was wiederum als wichtiger Hebelpunkt und Voraussetzung für einen echten systemischen Wandel angesehen werden kann.

“Sadly, extinction is not a topic that generates a great deal of popular interest at the present moment. I suspect, however, that in the future to come - if humanity is here at all - extinction will be among the handful of themes that is understood to be central, perhaps even definitional, of our time. We are the generations that are overseeing the loss of so much of the diversity of living forms on this planet, the generations that are perhaps yet to fully understand and respect the significance of the intimately entangled, co-evolved, forms of life with which we share this planet.”

(van Dooren 2014:5, Flightways)

“Being a good steward of the land requires being sensitive to the complexities of your given ecosystem. It involves how insects and even diseases fit into the garden or farm. Predators must be in balance with their prey. Weeds are guardians of the soil and provide habitat for creatures unknown. The soil is in a constant flux of change, and each season is unpredictable and different from the last one. This is the real work. -- In other words, it is a labor of love. Gardening must be done as a passionate endeavor.”

(Frank Holzman 2018:15, Radical Regenerative Gardening and Farming)

“Flowers are not the only thing that bloom in the garden—people do.”

(Heather Flores 2006:55, Food Not Lawns)

Prewords

The story of this research starts at two points in time. Firstly, when I realised that the admiration that I have for the natural world and the entanglements of it, and, my interest in the urban do not exclude one another but the opposite: the entanglements between humans and the rest of nature and all the amazing ways of coping are even more emphasized in the urban space – tight spatial spaces where everyone is aiming to find their own ways of living. And secondly, when we bought a narrowboat to live on, on the canals and rivers of London and were merged into the slow pace of life on the waterways, suddenly so intensively surrounded by every living species of the city. From the waters, London seemed more like “nature” than ever, but at the same time, the signs of environmental degradation were also clearer than ever. During this time, I have been amazed at what the residents, both individually and within the myriad of organisations, do in conservation efforts in that city - feels like every single patch has a “Friends of...” - organisation or a borough strategy for the management of it and the residents approach the space, both private and public with such love and care. Still, as a growing megacity, every inch of the land is contested - and conserving biodiversity does not always go hand in hand with those forces, despite all the knowledge that we have both of the obvious intrinsic value and of the instrumental value of the diverse nature - and, last but not least, the role of biodiversity as the prerequisite of all life on this planet.

But when it comes to urban areas and urban space, living in the middle of human disturbance demands creativity and resilience from all the living critters - but at the same time, it offers new opportunities. Actual co-living in the space may demand compromises but is not impossible. So, how to figure out the role of the urban within this crazy time of extinctions we are living in, how to figure out the role of the city dwellers, both human and non-human, living both on land and waters, during the biodiversity crisis? How do we address it, how do we treat it as a crisis, as a loss, and what can be said about the role of individual urban residents when it comes to urban biodiversity conservation? How can we motivate and mobilise the thousands of pairs of hands in the space, to work towards a more diverse city? How much and what can individuals do in the space that they have control over if they get access to scientific knowledge in a form they can then take into action? How can we not just advise, but also radicalise?

This research is a tiny admiration for small steps and local action while facing a systemic, huge challenge and threat. In general, I have doubts when it comes to individual action in environmental crises and the “every act counts” attitude. At the same time, especially in urban space that does have some kinds of borders and just includes so much life in a tiny space, every single action does count in that specific spot. And every single living creature that then finds refuge in these places, I guess there is no questioning if that is meaningful or not. I find comfort in the thought that these local actions contribute to larger-scale movement as well – from one garden to the neighbourhood to the city, and through these, to global biodiversity conservation.

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1 STEP INTO THE COMPLEX GARDEN : INTRODUCTION

How to live in the mess that we have created?

Let's imagine where we are. What is our context: we are living in a time of extinctions and biodiversity loss is one of the most pressing issues facing all life on our planet. That loss is sweeping species out of existence faster than ever before, faster than we even get to find and name them. At the same time, we are living in a time of rapid urbanisation: every day, more and more people live in urban areas and more and more land is cleared from underneath the urban development: buildings, roads and other infrastructure, but at the same time also from underneath industry, intensive monoculture farming - things that feed into our cities. Rapid urbanisation causes (at least) two things that are relevant in this research: directly the extinction of species, destruction of habitats and natural flows of "nature" - destroying the lifeways of living beings. What happens at the same time, is the "extinction of experience" (Miller, 2005) : the connection to the nature that we are inherently part of, is disturbed, maybe even completely cut off. Every day more and more people live in settings, where they have very little or even not at all connection to wild beings, the web of life, and they start to imagine, that we were never part of it.

If we imagine (based on William Cronon's work "Nature's Metropolis", (1992)) "first nature" meaning ecological relations (all the living creatures, their relations to others, humans included) and "second nature" referring to the changes created in the environment due to the capitalist world order, Anna Tsing (2015) in her masterfully written work "Mushroom at the end of the world" adds a "third nature": everything that is able to keep on living despite capitalism and the way how we have organised our societies. And that is what urban nature is, living in and creeping from all the cracks of the city, some of them planned by humans, some of them not. And somehow, in this space that is filled with human disturbance, and planned by humans for humans, the life of other creatures also keeps on going. Urban and nature do not necessarily exclude one another, but often the stories of co-living, resilience and great creativity to find possibilities for lifeways are found exactly in these tightly knit spaces.

In this context, we have all the knowledge on biodiversity loss and its root causes and consequences and at the same of the direct and indirect benefits of biological diversity. As a tangible approach, we do have cities from which high percentages are green areas, and as a focus of this work: over a quarter might be privately owned green areas: gardens. Spaces that are first of all, suitable for other living creatures to live in and move from one plot to another, and at the same time, spaces where humans cultivate, nurture, and admire the other ways of living, the nature - places and spaces where they do

connect with it. So, this is where the heroines of the story of this tiny research come in: the little garden and the little gardener.

1.1 Wildlife gardening and potential impact: The research questions

Wildlife gardening, or gardening for wildlife refers to a set of practices, that are done in domestic gardens and aim to improve the suitability of that habitat for wildlife (Davies et al., 2009). This can be seen as one, among many others, a tool for urban, and therefore global biodiversity conservation. This research roams around the potential impact of these actions in the garden in terms of local and global biodiversity conservation, examining the relationship between cities and the biodiversity crisis: the special focus lies on small-scale biodiversity conservation action that urban dwellers are able to do on the land that they have control over - their gardens and balconies or shared yards - and the potential impact of these actions. This is done by examining the possibilities of *wildlife gardening* by analysing the wildlife gardening guidance that is targeted to residents in the form of documents and educational events, the guidance that gives both information and reasoning why the actions are needed and practical advice on how to do that. This work searches for the answer to a research question:

What are the potential impacts of wildlife gardening in urban areas on both causes and effects of the biodiversity crisis and how is the need to act framed in biodiversity conservation guidance targeted to residents in the UK?

More specifically, we want to understand:

What is the potential impact of wildlife gardening on the root causes of the biodiversity crisis?

What is the potential impact of wildlife gardening on the conservation of different species groups?

How are the residents motivated: how does the guidance argue that the residents should take action?

How does the guidance frame the biodiversity crisis and link wildlife gardening to larger-scale conservation?

Can wildlife gardening be one solution to the extinction of experience and reconnect (urban) residents to nature?

To address these questions, a carefully selected sample of urban biodiversity conservation guidance (also called wildlife gardening guidance) will be analysed. In addition, a selected amount of online and in-person biodiversity conservation events, targeted to the general public, are participated and a similar analysis will be carried out on them. For analysis, a simple framework is created to see the

correspondence between scientific knowledge on biodiversity conservation and the suggested actions in the guidance documents and events.

1.2 Complexity as a challenge for understanding global cascading crises: Positionality as a researcher

Sustainability challenges, global crises and the concurrent global phenomena that we are living through right now, such as climate change, loss of biodiversity, poverty and inequality and rapid urbanisation are complex by nature - and very strongly interrelated. According to the sustainability scientist Risto Willamo et al. (2018), to address and somehow successfully deal with these challenges, we need comprehensive approaches that emphasize interconnections and perspectives of different disciplines. A set of methods is needed for understanding interactions among the many elements and actors (e.g. Sinclair et al., 2017, Meadows, 2008). These sustainability challenges, which are so-called *wicked problems* (Rittel & Webber, 1973), are defined by the complexity and intricacy of the issues: they have wide spatial and temporal scales, and they are the results of multiple drivers, joint effects and interconnected problems and are therefore challenging to grasp. Looking around us: basically all of the environmental and social crises that societies are trying to solve and navigate through currently, fall into this category of problems and it seems like the most common tools, and not just the tools to *solve*, but the tools to even *think* about them, do not seem sufficient.

Comprehensive thinking is, for example by Willamo et al. (2018), used as an antonym for *differentiative thinking*. Differentiative thinking includes all the approaches that concentrate on differentiation, reduction or specialization. Comprehensive thinking, therefore, refers to approaches, that aim to include complex phenomena holistically, realities as wholes and emphasize the connections between them. For sure, differentiative and comprehensive thinking are more the two ends of a sliding scale than two opposing forces and only focusing on comprehensive, would be as damaging as the dominating focus on the differentiative has been (Willamo et al. 2018). What is important to understand, is that in addition to the clear need for a comprehensive approach in the research and in solving complex challenges and wicked problems, we can also argue that the lack of understanding of complexity and the differentiative approach itself are one of the reasons behind the current sustainability crises (e.g. Willamo et al. 2018). Many environmental and social issues and challenges have been treated as separate issues without seeing the interconnectedness between their causes and effects. As Willamo et al. (2018) frame it, this has led to the prolongation and escalation of these challenges. This thought, that **the inability to approach the challenge in a needed way (holistic and comprehensive) is actually causing the challenge in the first place**, is very central in

addressing all the sustainability challenges, and also, especially in this work, and we will get back to it in the upcoming chapters.

To research these issues is for sure a task in between disciplines and it is a necessity that the research is building on top of each other. As a researcher, I want to be part of *thinking with* (an expression beautifully used by Donna Haraway and Maria Puig de Bellacasa), building upon the thinkers before me but combining this with something very practical: someone, the residents in their gardens, actually having their knees on the ground and their hands in the soil. This piece of interdisciplinary work aims to build on the research of ecologists and biologists on biodiversity loss and of the ones theorising the role of humans in this mess and our relationship with the loss and at the same time the care that we then practice towards the web of life and, of the ones who have turned these thoughts into practical guidance that anyone could follow. As Puig de Bellacasa (2012) frames it, doing research after others and trying not to be the “lone thinker”, but more “writing-with” others: *“It builds relation and community, that is: possibility.”* And that is what we need while navigating through these complex waters of these world-changing issues.

This work wishes to convey the entangled significance of the changing urban landscape. The changing landscape, declining biodiversity and the disappearance of species means the disappearance of different forms of life. Urban life, life in the cities for humans is built around the human ways of life, as cities are planned with their human inhabitants in mind. The ways how the loss of species, loss of different ways of life, and the loss of more-than-human others affect us, are sometimes visible but often go unnoticed. The point is, that the questions about urban biodiversity do not lie (only) in the amount or abundance of species, or the benefits the diversity brings to humans in the form of so-called ecosystem services but in developing an understanding of urban systems as part of something bigger, where life forms are connected to one another. When a certain lifeway is lost, other things disappear with it and this is what makes environmental crises *cascading* crises. What also urban environmental research and urban planning need is an understanding of the complex interconnectedness of the urban space to the other human systems (intensified agriculture, capitalist world order, urbanisation as a bigger phenomenon - all of which are kind of external of the city as a space but connected and creating the city as it is) and to the natural systems which make the human and non-human life on this planet possible.

1.3 Why look at all of this in a garden? Narrowing down from complexity

Despite the interwoven and complex nature of the topic as described in the previous chapter, biodiversity, ecosystems and living environments, different species and their coexistence in these

environments is at the same time something really tangible - therefore we are able to examine, record and research, and also act on it, on a smaller scale as well. This research is looking at this large-scale issue in a small location, in a tiny urban unit: an urban garden. There are other green spaces in the urban areas as well, and it is to be acknowledged that much of the conservation efforts are focused on these: protected areas, reserves and parks – big green areas that provide larger and more diverse habitats. The importance of these areas in cities is indisputable. This type of research however exists relatively widely, whereas gardens have been neglected in biodiversity research for decades, both because they were not considered interesting or to have great ecological value and also because the research of those habitats is time-consuming and expensive (Goddard et al., 2010; RHS 2023). It is also interesting to focus on private actors instead of public ones: residents work with different motivations than for example a city department would do and therefore there lies different meanings and different pathways to impact.

If the biodiversity crisis is to be framed through interdisciplinarity, the locality where this work aims to research it, both *the urban* and *the garden*, is as well. A researcher of politics of gardens, George McKay(2011), states in his book “Radical Gardening: Politics, Idealism and Rebellion in the Garden” “-- it is not in fact very difficult to be “interdisciplinary” when it comes to gardens, because there is not really a “discipline” of garden study”. These tiny, contested urban pieces of land, in the intersection of property and ownership, and at the same time nature and more-than-human, a pleasure and a necessity, are for sure to be approached from the viewpoints of different fields and to be understood as more than adjacent of the house. And gardens are a bit odd places in a city: often private behind fences and houses, sometimes public like front gardens or balcony and boat gardens are, somehow at least historically continuation of the “feminine” realm of the house (kitchen and dining areas) but at the same time places for everyone in the house, privately managed but still forced to follow for example some city-wide rules. Gardening can mean so much to people and a garden in a tight-knit urban structure is a tiny safe haven, both for other animals and the gardeners themselves. The common public perception of gardening is somehow often related to leisure, something suburban, probably middle-class and white, but at the same time throughout history garden spaces are often described as a place of resistance and rebellion (e.g. McKay 2011).

When it comes to the need for *radical* approaches in navigating this world, gardening actually offers quite an interesting angle to it: the origin of the word radical comes from the Latin *radicalis*, "of, relating to, or proceeding from a root." (Merriam-Webster, retrieved 8/23) To be radical is therefore to have roots and plants are radical subjects themselves. A community garden activist Heather Flores defines in her book Food Not Lawns (2006) that many people could label her approaches as “radical”, but she defines it “as radical only in that it comes from, and returns to, the root of the problem: namely, how to live on the earth in peace and perpetuity.” This etymological angle gives meaning to

the whole discussion: we aim to head to the root of the crisis (root causes of biodiversity crisis defined by ecologists) but also examine whether the root lies somewhere in other leverage points. In any case, we are heading towards the root of the radical.

Much of the radical or political gardening literature focuses on urban gardening in the form of allotments, community gardens and guerrilla gardening - the types of gardening that form communities and that claim the urban space for itself (look e.g. Sackey, 2022 or (Millie, 2022) Urban gardening is often seen as a way to take space in the neoliberal city, where all the terrain is contested and fought for. These types of gardening discourse have tied the gardens and the act of gardening for example to the right to the city -discourse (Purcell & Tyman, 2014) and the garden becoming a place for social life and inclusion.

However, this work focuses on gardens in their “traditional” sense - gardens that are adjacent to houses, apartments, boats - all types of homes - plots of land, roofs or balconies that are somehow in permanent use by the inhabitant of that home. I acknowledge that this is only one form of gardening, especially in the urban environment, and that by cutting away the more communal and potentially more “radical” forms of gardening some important aspects are left out. Also, I acknowledge that having a garden (or balcony or any piece of land) that you can take care of, is a privilege in a contested, tight urban space and not available for everyone - communal gardening and other initiatives in public space can be, for sure, more inclusive and accessible. These two forms of gardening do not however exclude one other. In addition, the accessibility of gardening and garden space differs from one country, city and urban structure to another – in some cities having a garden (or even a balcony) is rare, and mostly available outside the central areas and only for homeowners or with rents that are unaffordable for most people. Then for example in the UK, where this research focuses on, the urban structure even in big cities like London, has lots of gardens, and having one is not as tightly tied to the level of income. (More about the specifics of the UK context in chapter 4 – research design)

In addition to that the analysis in this research focuses on guidance targeted to residents that have some kind of access to a private plot of land, the analysed documents also represent somehow a “mainstream” of biodiversity and gardening materials. This is a conscious choice - for sure more radical, more alternative gardening and conservation advice does exist, which focuses and emphasizes different things. I wanted to, however, focus on the materials that are easily accessible for anyone, without prior knowledge of any topics surrounding conservation or biodiversity, let alone the politics of them. I consider these documents, and the “target group” of this guidance, to represent the general urban gardener. Deciding which documents or organisations providing the advice are “mainstream” and which ones are not, is, of course, a matter of decision. The choice of documents however consists of the biggest and oldest, and therefore the most established organisations in the UK and also of

documents that are mentioned in the official environmental plans of cities in the UK (and we can expect them not to be too alternative).

If a garden is a tiny unit in the city and gardening is one sort of activity, the continuing question for this is: are gardens and the experiences in the garden creating something that we could call a bubble of experience (something that we experience only there and do not understand in relation to other things in our lives and in our world) or can gardening, especially gardening through the guidance for doing it for wildlife, be considered being a new ontological approach (this is how the world is)? Anna Tsing writes about the “arts of noticing” (Tsing 2015). How do we learn to notice things in this world and how does this skill follow us in our life: how do we learn to understand that everything is connected, and see ourselves as parts of this beautiful interconnected web of life? This applies to the experience of the garden: do we feel the connection also still, when we leave our front door to the other side, when the world is so strictly divided into the realms of nature and society, as if human society wouldn’t be linked and dependent on what we call *nature*. Nature, that is, everything we have and are. Is the garden experienced as a “visit” to this connection, without realising that we are always connected, or does that connection last to the other parts of our way of living as well? This possible connection makes gardens and gardening a very relevant spatial location to look at this issue.

1.4 The structure of the work

In the coming chapter, we will first review comprehensive approaches to solving sustainability challenges, relevant academic literature to shed light on biodiversity loss and the relationship of the loss with urbanisation and the literature focusing on wildlife gardening and biodiversity conservation in urban areas, especially in the UK. The literature on the leverages of sustainability transitions is also reviewed. The literature review is followed by the methodology section, which will go deeper into the case and data selection and will present the selected data in detail. The chapter will also present and argue for the framework used in the analysis. The results from the analysis are presented in the results chapter and lastly, discussed more in-depth while contrasting back to the literature. Answers to the research questions will emerge through the analysis and discussion.

2 HOW TO UNDERSTAND THE ROLE OF THE CITY IN THE TIME OF EXTINCTIONS - HOW TO MAKE THE JOURNEY FROM THE CRISIS TO THE GARDEN AND BACK? : LITERATURE REVIEW

This chapter lays the groundwork for the study. It reviews the literature focusing on urban biodiversity conservation starting from a bigger scale towards smaller, from framing biodiversity crisis as a wicked problem and understanding the biodiversity crisis as a larger complex phenomenon to finally to the small-scale actions, and possibilities to act, of individuals in urban environments. The parts of the story in this work range from the global scale phenomenon (**biodiversity crisis**) to the humans in it (**us living in the times of extinction**) to the tiny spatial scale (**the garden**) to the human in the garden (**the gardener**). The work weaves through, and back and forth, these varying spatial and temporal scales and does that, despite its chaoticness, on purpose: all of the scales are equally real and co-existing. As ecologist Evelyn Pielou (1975) demonstrated, scale defines diversity. According to her, scale relates to how systems self-organise but also to how they are studied – if a wrong scale for analysis is used, something might get lost on the way (Sinclair et al., 2017). When approaching multifaceted issues like biodiversity loss, it is crucial to understand them without trying to reduce their complexity and simplifying the world we are dwelling in. This literature review moves around these different levels of complexity crossing some complexity thresholds (Willamo et al. 2018) on the way and it will make a loop from big scale to small and back, generating the problem statement.

In this chapter, we will first examine complexity science and the comprehensive approach more in detail and frame our problem at hand as a wicked problem to stage the background of this thesis. Then we dive into the research on the biodiversity crisis and portray the current crisis and its meaning for the natural world and human societies: why do we have to be (extremely) worried about the loss of biodiversity? We then shed light on the role of the urban - cities as a spatial location and urbanisation as a process - in biodiversity loss. What is their impact, both negative and positive, on biodiversity? From the city level we step into the smallest level, the level of a garden: what are the actions that individuals can take on that tiny plot of land and what actually is wildlife gardening? What is the potential role of garden space in biodiversity conservation? To conclude the literature review chapter, we will turn around back to the bigger scale: what are actually the leverages in sustainability transitions, that we are possibly trying to touch with wildlife gardening?

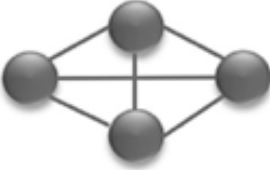
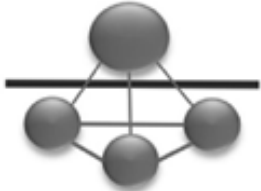
2.1 Complexity science providing tools for understanding global sustainability challenges

The intricate nature of sustainability challenges and the simultaneous global phenomena we are presently experiencing, like climate change, biodiversity loss and rapid urbanisation, stem from their complexity and profound interconnectedness. Basically, all the sustainability challenges can be framed as *wicked problems* (Rittel & Webber 1973) and as stated before, to research them, we need approaches that combine different disciplines and emphasize interconnections and links in between (Meadows 2008, Willamo et al. 2018). Complexity science works here as a good example of that: it is a study of non-linear systems, that do not act in a predictable manner. Complexity science also includes the study of *complex adaptive systems* (CAS) (Sinclair et al. 2018). Basically, CAS systems are defined as a “*set of things – people, cells, molecules, or whatever – interconnected in such a way that they produce their own pattern of behaviour over time*” (Meadows 2008). This definition fits many systems on this planet, but definitely for example to any ecosystem, to a city, neighbourhood or a garden.

The main idea could be summarized with a classical example of “ $1+1=3$ ”, the whole is greater than the sum of its parts. Interestingly, with these emergent parts combined with the linear and predictable attributes, it is therefore difficult to establish causation (Sinclair et al. 2018). This holds true with most of the sustainability challenges but is central also in this research: to research *potential impact* in gardens, it is to be understood that the causes and effects of certain actions are probably not that straightforward. This combined with the variation of spatial scales (gardens being tiny units *within* a larger unit, the city) and temporal scales (when do we decide to study the impact and what has happened before that), makes it clear that studying environmental changes is not simple, not even when we would have chosen a unit of study as small and familiar as a garden.

Traditionally, research has approached complex problems by breaking the whole into smaller parts that are easier to study (e.g. Sinclair et al. 2018). Reductionism has been a central approach in all kinds of science for centuries (Gershenson, 2013) and the differentiative approaches have been dominating especially in natural sciences in the global north (Willamo et al. 2018). As Gershenson (2013) argues, reductionism is done in science for convenience: it is simply easier to study phenomena in isolation. But, he continues, as nothing is isolated, whether or not we neglect the interactions between things, it doesn’t make them disappear. Researching an issue in isolation to understand it better takes us further from the “big picture” (Gershenson 2013) and avoids the higher-level phenomena by assuming that they can be explained by the processes at lower levels (Sinclair et al. 2018). Complexity science therefore focuses directly on big-scale, higher-level phenomena (Sinclair et al. 2018).

This “big picture” that Gersherson (2012) is referring to and the difference between differentiative and comprehensive approaches, can be also illustrated for example in the following graph, developed by Willamo et al. (2018). This sets up the question of this research very well.

Comprehensive approach		Differentiative approach
1) Select the object		4) Focus on one part and exclude the others (specialism)
2) Add more objects (generalism)		3) Focus on parts and exclude interconnections between parts (atomism)
3) Outline the interconnections between the objects (holism)		2) Consider the object as a one-levelled structure and exclude complexity thresholds ("planism")
4) Arrange the system as a holarchy, an emergent hierarchy, where the system levels are divided by complexity thresholds (holarchism)		1) Select the object

Graph 1. Differences between comprehensive and differentiative thinking. Willamo et al. 2018

Wicked problems, due to their multifaceted nature, escape definitive formulations. As Rittel and Webber (1973) argue: “*The information needed to understand the problem depends upon one's idea for solving it*“. This means that to only *describe* the problem, we would need to know all the possible *solutions* already as well: the problem and its solutions are inseparable. But finding these solutions is difficult as there is no “stopping rule” - the moment when we could say that we are “done”, that the problem is solved for good - doesn’t exist with wicked problems. Compared to what Rittel and Webber (1973) describe as “tame problems”, the ones that our scientific processes are used to and equipped to solve, wicked problems have values intertwined in them and it is hard to evaluate them in an objective way. Solutions are assessed more on a scale of good-bad than true-false. This is easy to

see if we are thinking of any public debate on any of the aforementioned sustainability challenges, as the debate turns a lot more around values and responsibilities, *what is right*, than on *what would work*. In addition, wicked problems are unique and there is no possibility to test the solutions in a vacuum, meaning that every attempt to solve the challenge has real-life, often irreversible effects that affect the world, people and other living beings. Every proposed solution can cause unforeseeable results (in all systemic levels and temporal scales) and cause a new group of problems where the original solution will not have a role anymore (Rittel and Webber 1973, Willamo et al. 2018).

As sustainability challenges are wicked problems, attempts to solve them have proven to be hard. The sustainability crisis encompasses various aspects of ecological, social, cultural, and societal systems, and it has a profound impact on almost every field of society and study. As a result, there is a demand for experts in specific areas of research, as well as individuals who possess a comprehensive understanding of multiple disciplines. These ways of research are capable of integrating diverse knowledge and grasping the interconnectedness between society and the natural world. And what becomes central in understanding all sustainability crises, and I would argue that especially biodiversity crisis and in this thesis research as well is the possibility of comprehensive approaches to integrate the role of humans and their institutions as parts of the examined system. This is not because humans would have any bigger importance per se, but because understanding humans as a part of rest of the nature is vital for understanding both our impact on the crisis and also the effects that the collapsing ecosystem would cause to us as well, as parts of this system. It becomes necessary to comprehend not only the environmental impacts of human behaviour, but also the underlying reasons and key motivators (such as biological, economic, political, philosophical, technological factors, and more) that drive these actions at individual, societal, and cultural levels. This is precisely why holistic thinking and the integration of diverse knowledge domains are crucial in addressing sustainability issues. However, even though wickedness might cause unforeseeable results when the problems are addressed, it does not mean that they are always completely unsolvable, let alone that we couldn't, or *shouldn't*, do anything. (Willamo et al. 2018) In the next chapter, we will lay out the big-scale problem, the biodiversity crisis, that we can start to look at with the comprehensive goggles.

2.2 Biodiversity crisis: Living in the time of extinctions

Biodiversity is “*the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems*”, according to the Convention on Biological Diversity (CBD) (United Nations, 1992). We are now witnessing a drastic loss in biodiversity and the rate of change globally in nature during the past 50 years is unprecedented

in human history (IPBES, 2019). The current loss and crisis are anthropogenic. The research suggests that humans are now on the track to causing the 6th mass extinction by destroying habitats, extracting resources, introducing invasive species, hunting and exploiting species directly and spreading pathogens, introducing new chemicals and toxins and also, changing the global climate (Barnosky et al., 2011; van Dooren, 2014). According to IPBES, Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2019:16), *“the direct drivers of change in nature with the largest global impact have been (starting with those with most impact): changes in land and sea use; direct exploitation of organisms; climate change; pollution; and invasion of alien species. Those five direct drivers result from an array of underlying causes – the indirect drivers of change – which are in turn underpinned by societal values and behaviours that include production and consumption patterns, human population dynamics and trends, trade, technological innovations and local through global governance.”* Biodiversity is declining worldwide, but some spots, and species, are hardest hit.

Estimating the scale of the loss

The estimates of the current extinction rates vary, and the scale of biodiversity loss is not known with any real certainty (e.g. Barnosky et al., 2011; Ceballos et al., 2015; van Dooren, 2014). All the documented numbers are likely to be grave underestimates because most likely only a fraction of the species on our planet are formally described (e.g. Barnosky et al. 2011). So even though we are rapidly gaining more knowledge on the diversity of our world and about the loss that we experience, still:

“- our knowledge of this situation remains thoroughly partial. The total number of species being driven over the edge in this “time of extinctions” (Rose and van Dooren 2011) simply overwhelms our capacity for understanding. We just do not know how many are being lost: How could we, when we do not even know how many species there are on this planet with any reasonable degree of certainty?”
(Van Dooren 2014:7)

The current speed and depth of extinctions are estimated by comparing the (estimated) current and past extinction rates and comparing them to the so-called normal background extinction level. This is challenging because as stated before, we really do not have enough data to base any of these estimates on to make exact assumptions. However, the global rate of species extinction is at least tens to hundreds of times higher than the average extinction rate over the past 10 million years (IPBES 2019; Dirzo, 2003; Ceballos et al. 2015). Some researchers assume even higher numbers, estimating that current extinction rates would be 1000 times higher than natural background extinction and that future rates would increase tenfold (De Vos et al., 2015). As some research has been criticised for exaggerating the speed and threat of biodiversity loss, several researchers mention taking extremely conservative (in this case meaning low) estimates as their baseline (Ceballos et al. 2015, Barnosky et

al. 2011). However, for example, Ceballos et al. (2015) describe: *“Even under our assumptions, which would tend to minimize evidence of an incipient mass extinction, the average rate of vertebrate species loss over the last century is up to 100 times higher than the background rate.”* This would mean that the number of species, that have gone extinct during the last 100 years would have taken, on the background extinction rate, between 800 and 10 000 years to disappear. Human actions have already driven at least 680 vertebrate species to extinction since the year 1500 (IPBES 2019).

Also, the threat of extinction is growing. According to IPBES (2019:238), *“It is probable that at least a million animal and plant species – more than one in eight – already face global extinction.”* On the IUCN Red List, which lists species according to their risk of extinction, the proportion of species having a *vulnerable, endangered or critically endangered* status, averages around 25% of all species (IPBES 2019:239). The term extinction debt is central: some species have not yet disappeared, even though the prerequisites for their survival would be already, and irreversibly, gone. There is a huge extinction wave awaiting, as the extinction “happens” only when the last individual dies, but we do know, that multiple species do not have the possibility to live anymore in the way that they do. (e.g. Van Dooren 2014)

The distribution of loss across space and species

Biodiversity, or extinctions, do not fall evenly geographically on the planet Earth. Key Biodiversity Areas (KBAs) are the most important places in the world for species and their habitats and KBA is currently the most comprehensive dataset recognising those spots (IUCN, 2016). Also, endemism is important when we discuss biodiversity and its loss and location. Endemism refers to the restriction of kinds of organisms to particular geographical areas (Dirzo et al. 2003:144). If a species is tightly tied to a certain location, it is also more fragile to the threats, for example, habitat destruction. For example, islands and other isolated locations holding multiple endemic species tend to do quite badly in the crisis. As an example, only approximately 20% of the world's bird species are confined to islands, but 90% of the bird species extinctions have been of those island species (Quammen 1996:264 according to van Dooren 2014:6). This is interesting, and tied to urban development as well, also through the concept of “side fidelity”: some species, even though they could have the possibility to choose for example their nesting places where they return every year, have strong site fidelity and they keep returning, even to destroyed landscapes. This doesn’t necessarily have to do only with biology or instincts, but also other animals are capable of “placemaking”: places are not interchangeable but *“nested and interwoven with layers of attention and meaning”* (van Dooren 2014). This kind of site fidelity and changing environments can create difficult combinations especially in rapidly changing urban areas: as logical as it would sound to the developer, as urban areas grow, we can’t assume that the species and individuals would automatically move to the nearby, seemingly similar natural areas.

The biodiversity crisis isn't distributed evenly geographically, but also not across taxonomic groups: some taxonomic groups and families will be hardest hit (Van Dooren 2014:6, IPBES 2019). Among vertebrates, especially amphibians and both terrestrial and marine mammals are at high risk. The IUCN data recognises knowledge gaps in conservation status and population trends in insect, fungal and microbial species. (IUCN 2018:239,242) These species are nevertheless crucial to global ecosystems (and humans as part of them) as they are entangled into life forms of all others: from pollination to symbiotic fungi.

And this is the crucial thing about the extinctions: the interdependencies (*"dependence becomes a peril rather than a blessing"* (Rose, 2017)), relationships (that we don't yet even know about) and mutualities between species will cause cascades of extinctions. As Rose (2017) puts it: *"We are looking at worlds of loss that are much greater than the numbers suggest"*. When something disappears, something else will disappear with it and the lengths of these chain reactions can be immense.

Environmental humanities and extinction studies

Extinctions and the loss of biodiversity are of course widely researched in natural sciences, but also in humanities and social sciences. The humanities research is dealing with the entanglements of humans in these processes of loss: diving into the possible futures of life in this time of extinctions. The researchers of The Extinction Studies Working Group, for example, Deborah Bird Rose, Donna Haraway and Thom van Dooren have published several inspiring academic articles and books, exploring multi-disciplinary approaches to extinction from a humanities and social sciences perspective (Extinction Studies Working Group 2022.). These multidisciplinary approaches are making it possible to understand how living in the time of extinctions touches all the spheres of life and also how it possibly *feels like*. These thinkers are also closely linked with all the multispecies research (e.g. Anna Tsing et al.), which also contributes to the understanding of entangled relations and extinctions and biodiversity loss as a complex issue, loss of a species but also as a loss of a certain way of life. This branch of research provides tools to deal with the crisis more comprehensively, not only focusing on the viewpoints of natural sciences. These tools can help to comprehend the role of humans in this mess, both as a main cause of extinctions, but at the same time suffering from the effects, and, at the same time, as an actor in conservation (Van Dooren 2014). These viewpoints and tools become central when we, like in this research, look at urban conservation, conservation that happens in an area with huge human disturbance.

However, despite the increasing knowledge about biodiversity loss, and “*its increased inclusion in policy and planning, biodiversity loss continues*” (Knapp et al., 2021). Knapp et al. (2021) continue: “*There are gaps in our understanding critical to improving biodiversity conservation policies and management in urban areas that need to be filled to improve global biodiversity outcomes.*” When it comes to biodiversity loss and our actions on it, it is relevant not to only look at what has happened (e.g. extinction rate), but to calculate what that means for the future and the present moment. Barnosky et al. (2011) state in their research article “Has the Earth’s sixth mass extinction already arrived?”, that “*the huge difference between where we are now, and where we could easily be within a few generations, reveals the urgency of relieving the pressures that are pushing today’s species towards extinction.*” This ties together the scientific knowledge of the crisis with the urgency to act: the increasing body of research and the alarming results we get from it is nothing less than a call for action.

2.3 Role of urbanisation and urban areas in the biodiversity question

Urban biodiversity is a complex and multifaceted topic that can be examined from different angles and cities and biodiversity questions are interlinked in multiple ways. To support urban biodiversity conservation is to support global biodiversity conservation as well, and therefore urban conservation has to be planned in a way that it does not only have local effects but also supports global biodiversity conservation. (e.g. Knapp et al. 2021) Cities are major drivers in biodiversity loss and other environmental crises. At the same time, cities are homes for an ever-growing number of people and other living creatures. The question of urban biodiversity has been increasingly present in the discussion and research around cities and urbanisation, especially during the last decade. The increased interest in the topic is not a surprise taking into account the concurrent global trends - rapid urbanisation increasing the significance of things happening in urban areas, climate change changing living environments both in cities and outside of them even faster than anticipated and the drastic wave of extinctions, which is expected to change ecosystems all over the planet.

Impacts of urbanisation: direct and indirect effects on biodiversity

Biodiversity is declining worldwide, driven foremost by the intensification of land management and the transformation of natural areas for agriculture, production, forestry, and settlements (IPBES 2019). It is well established in the literature that the overall effects of urbanisation on biodiversity are negative (e.g. McDonald et al., 2020). Urban areas have doubled since 1992 (IPBES 2019) and are growing rapidly. The United Nations estimates that between 2021 and 2050, the world will see 2,2 billion new urban residents (UN-Habitat, 2022). Most of the most rapid urban growth is located in

regions of high biodiversity and in areas that are identified as biodiversity hotspots (e.g. Seto et al., 2012). The effects of urbanisation do not spread evenly across the globe and therefore the phenomena and its adjacent effects are different in different parts of the world. The fact that the dense areas of human settlements and species-rich regions co-occur (Luck, 2007) is not a coincidence as such: some of the same features that lured humans to originally settle and build up their city there, lure also other taxonomic groups. Topography, access to navigation, availability of fresh water, temperate climate, and agriculturally rich soil have affected where contemporary cities are located. As growing cities are located in biodiversity hotspots, their direct effect on biodiversity is relatively bigger.

Urbanisation and urban areas obviously affect larger areas than the city surface itself, affecting ecosystems far beyond the urban, through resource demands, pollution, and climate impacts (McDonald et al. 2019). Urbanisation affects ecological patterns and processes and causes habitat changes (fragmentation and degradation). It creates changes to biological assemblages, that then result in new ecological communities. In an urban setting, this happens, for example, through bringing in non-native species (urban areas being both historically and present-day transportation hubs, where different species travel with human transportation) and creating more favourable conditions for some species that adapt easily and, at the same time, non-favourable conditions for other species (leading to extinctions and species changing regions). Urbanisation also leads to increased levels of pollution in soil, air, and water systems; and alters ecosystem services and processes, such as water and nutrient cycling (Nilon et al., 2017).

The impacts of urbanisation on biodiversity can roughly be divided into direct and indirect impacts. According to McDonald et al. (2020), direct impacts are the ones that are linked to landcover change due to expanding urban area cover: for example, habitat loss, habitat change and decreasing habitat connectivity between ecological patches. Indirect impacts are caused by for example resource extraction to supply the city, e.g. food and energy production. It is important to recognise, that these indirect impacts, even through something like food demand and therefore intensified agriculture, are massive when it comes to conservation. Also, waste and pollution coming out of the city has an impact on a larger area than the city itself. It is clear, that the socio-ecological effects of urban environments extend far beyond the physical borders of cities and some of the most crucial global environmental problems are the result of urbanisation (McDonnell & MacGregor-Fors, 2016). According to a review of scientific literature that aimed to address the research gaps in the study of urban growth impacts on biodiversity, by McDonald et al. (2020), the indirect impacts of urbanisation on biodiversity are studied only in relatively few studies (approx. 30% from 922 studies).

Urban ecologies

The urban biodiversity question has however been researched in multiple different fields because as an urban (and global) issue it touches several disciplines. One of the most central fields is urban ecology. Urban ecology mostly focuses on biodiversity, ecosystem processes, and ecosystem service attributes of cities. (e.g. Niemelä, 1999) Lately and increasingly, urban ecology is combining knowledge with socioeconomic processes and urban management, planning and design. The discipline of urban ecology emerged in the 1990s, for documenting the distribution and abundance of species in cities. (McDonnell et al. 2016) A focus towards urban ecology was partly driven by the realisation that urbanisation is a big factor in changing the natural world and that humans are central actors in all ecosystems, almost regardless of their distance from human settlements (Pickett et al., 2016). Urban wildlife ecology and research is focusing more on urban wildlife, providing knowledge of wildlife and plant populations in urban areas (L. W. Adams, 2005) The ecologies and ecosystems in urban areas can be researched with the tools and methods of general ecology, but the intense influence and presence of humans in urban areas make the discipline of urban ecology useful (Niemelä 1999).

It can be argued that urban ecological science has experienced a paradigm shift or expansion “*from a marginal interest to a widely pursued and theoretically motivated ecological field*” (Pickett et al 2016.), because urban ecology is used as a tool for achieving goals that are considered important for today’s cities. Focus on urban questions and urban biodiversity arises from the growing interest in the sustainability of cities in the 21st century (e.g. (Birch & Wachter, 2008) and research on urban ecology today often mentions its possibilities to contribute to “create livable cities” (McDonnell et al. 2016), “shape a more sustainable urban future” (Pickett et al. 2016), “greater sustainability of urban ecosystems” (Adams 2005) or “integrate ecology better into urban planning” (Niemelä 1999). This shift can be interpreted as a positive thing: urban ecology has a more prominent role also in planning agencies and city government and ecological knowledge is affecting planning decisions. The understanding, that the ecological well-being of the urban area affects the “livability” of a city, has increased. However, we still need research about topics in urban ecology that are not directly linked to certain urban projects or certain ecosystem services and their benefits for the human dwellers of the city. The need for comprehensive approaches has been mentioned multiple times but is relevant here as well: as Kay et al. (2022) demand for, is cooperation between urban planners and wildlife researchers and ecologists, as urban planning can only adequately address wildlife issues if wildlife experts with relevant data are included, and vice versa.

Some criticism and questions are raised for the possibilities of current urban ecology to understand the effects of urbanisation on biodiversity and ecosystem functioning in urbanising landscapes. Contemporary cities are expanding in a spatially complex and non-linear manner which differs from historical patterns of urban growth. According to Ramalho et al. (2012), these patterns are not taken

into account enough in urban ecological research. Especially the temporal dimension of urban and urban change is often ignored, and the focus lies only on spatiality (Ramalho & Hobbs, 2012).

Urban areas as refugia for species

Despite the overall negative effects of urbanisation, cities do, however, have also beneficial effects on biodiversity and they support a large number of different species. Some species even have larger population sizes, higher productivity and higher growth rates in urban areas than elsewhere (e.g. Spotswood et al., 2021). The response to urbanisation varies a lot between different species and some species, mostly the most generalist species, do well, even thrive, in cities. The existence of them in the urban area depends on their ability to adapt to highly modified landscapes (P. J. Baker & Harris, 2007). Urban areas contain patches of semi-natural habitats and gardens, which provide habitats. The bigger the species, especially with urban mammals, the existence of these species also relies on tolerance from humans and conflict: how likely the humans are to tolerate the co-living with these animals for example in their gardens. (P. J. Baker & Harris, 2007). As Knapp et al. (2021) argue, urban areas can function as a refugia for different species and biodiversity, and this holds especially when the surrounding areas are highly altered. According to Spotswood et al. (2021), the research on the effects of urban areas on biodiversity and different species has concentrated too narrowly on the negative impacts, and we do not have a comprehensive picture of the potential positive effects. As cities grow, we need them to participate in the global conservation effort - therefore we need to know, what is the ecological role of a city within its landscape and region. The qualities of the area surrounding the city affect the ecological role of the urban area in the region. To put it simply, the more disturbed and altered the surrounding area is (e.g. high-intensity agriculture, forestry or industry), the more benefits, opportunities and resources the species might gain from wandering to the city. And the opposite, if the surroundings are pristine, well-connected habitats, the species are more likely to stay in these areas. (Spotswood et al. 2021, Knapp et al. 2021)

Urban areas can therefore function as a refugia for species. Knapp and colleagues (2021) analyse, that there are at least five different ways to do this. Firstly, urban areas can provide habitats for species that are threatened in the regional landscape. Secondly, some human activities and support to certain species can help populations through periods of stress (e.g. bird feeding during winter). Thirdly, some species can escape interspecies relations, that are not beneficial to them, e.g. predatory or herbivory. In this case, the city functions literally as a refuge. Fourth they mention that the first urban adapters might be precursors in adapting to other natural changes as well, for example, climate change. Interestingly enough for this work, as the fifth point, Knapp et al. (2021) describe the role of having more nature in the city in involving the wider public in conservation efforts. Also for example

Ramalho et al. (2012) underline that nature in the city is for many people the only connection to the natural world. Preventing “the extinction of the experience”, the urban residents' experiences of wildlife is highly important for global conservation work (Dunn et al., 2006; Miller, 2005; Ramalho & Hobbs, 2012)

Focus on biodiversity plans and wildlife-friendly urban planning

Beyond natural sciences, there has been an increase in public policies and programs related to biodiversity and its benefits on human well-being and health, ecosystem services and livable urban areas (e.g. Nilon et al. 2017). The majority of major European cities have some kind of biodiversity strategy or a plan, either as a separate document or as part of national biodiversity and/or climate strategies. This is also supported e.g. from the EU level, by the “EU biodiversity strategy for 2030” which calls for European cities to develop their urban greening plans (European Commission, 2020). The level of detail, ambition and goals, and temporal and spatial scales of these plans vary. There is also variation in the processes of creating the strategies, for example, which stakeholders were involved, how the cooperation with biodiversity experts was carried out, how much the citizens were informed and participated and how these processes were politically managed. According to Nilon et al. (2017:332), most of the plans lack quantitative targets, which might lead to unsuccessful implementation of the plan in action.

This all creates an image that cities are working actively on enhancing urban biodiversity and by that also participating in global biodiversity enhancement. However, despite these actions, expanding biodiversity knowledge and its inclusion in planning and policymaking, the loss of biodiversity continues (Knapp et al. 2021). If we simply look at the amount of action, it is easy to imagine that urban biodiversity issues are well taken care of. However, the reason for all these strategies is the *need* for them, that the destruction of our environment is still very much ongoing.

As we are witnessing an urbanisation process like never seen before on this planet and the city surface area is expanding at an unprecedented pace, the need for wildlife-inclusive urban planning and urban design becomes highly important. When the building and human density increases, the fitting-in becomes more and more difficult for different species (Kay et al. 2022). As Knapp et al. (2021) describe: “*It is increasingly important to consider not just the needs and well-being of humans, but also those of wildlife to facilitate sustainable human-wildlife coexistence*”. Different barriers do stand in the way of wildlife-inclusive planning. Kay et al. (2022) argue that for example lack of incentives to work cross-disciplinary leads to disciplinary silos, where humans and wildlife are treated separately, and urban ecology and urban planning stay in their lots. Both within academia, the researchers are not incentivised to work with planners and vice versa, there are no incentives for planners to try to include

ecological information in their work. Scale (both spatial and temporal) poses a different challenge (and that stays true in this thesis as well, as we in the upcoming chapters look at the possibilities of combining one of the smallest green urban units to the larger, neighbourhood, landscape and city management): as planners usually work on a small scale, whether it is a lot, park, or a neighbourhood, and researchers can work from microscopic to very large scale, the working scales do not always match. Wildlife, however, uses the space however it wishes. Also, temporal scales are challenging. For example, the wished results of a newly planned wildlife-friendly park (for example an increased number of birds), might occur, but only after a certain amount of time, and, not necessarily in that specific park, but in the local region. The mismatch between anticipated and measurable results can be discouraging for urban planners with wildlife in mind and that causes challenges in integrating biodiversity conservation in urban planning.

2.4 What can be done in urban areas then: urban conservation action and wildlife gardening as one of its tools

Urban biodiversity conservation is one important part of the global biodiversity conservation effort. This work focuses on one urban spatial scale unit, a garden: often tiny, sometimes bigger, usually at least partly green, private, domestic or communal and located adjacent to the housing. Private gardens are a sizable component of many cities and form a surprisingly significant part of the urban surface, but especially of the urban green surface area. For example in the UK, research found that in 5 major British cities, gardens composed roughly a quarter of the urban surface area (Loram et al., 2007). Therefore, the way this land area, a quarter of the city, is managed has a big potential impact on urban biodiversity (Davies et al., 2009; Goddard et al., 2010, 2013). While the conservation efforts in urban areas have understandably traditionally concentrated on parks and other big greeneries, protected areas and reserves, the potential of private gardens as a valuable and often overlooked resource for enhancing urban biodiversity is becoming increasingly recognized (Goddard et al. 2010).

What is wildlife gardening?

Gardening has been present in human societies for thousands of years and its role in human lives has maybe shifted, but not lost its importance (Uglow, 2004) Gardening forms an important relationship between the gardener and the rest of nature that they immerse themselves in and in a gardening context, cooperate with. Mumaw et al. (2022) describe it being “*a ubiquitous relationship with nature, that involves the mind, the body, senses and the culture*”. Especially urban gardens are considered to be places of deep attachment and important building blocks of identity (Clayton, 2007).

Wildlife gardening entwines gardening to support local species and create habitats for them. In practice, wildlife gardening (or gardening for wildlife, wildlife-friendly gardening, sometimes conservation gardening or habitat gardening) (Mumaw et al. 2022) refers to a set of practices adopted in the garden environment, that are beneficial for wildlife. Broadly, we can define wildlife gardening to be any actions done in private or domestic gardens, that aim to increase their suitability for wildlife (Davies et al. 2009) and the actions either aim to support existing wildlife in the garden or in addition, to attract them to the garden. In practice, these actions improve the availability of different resources for wildlife (Davies et al. 2009), meaning in practice providing food, water, shelter and places to breed, the four main things that wildlife needs (Wildlife Trusts 2023, Devon Wildlife Trust 2023).

Gardening for wildlife is not a new phenomenon per se. Throughout time people have admired wildlife close to their homes, for example, birds or big and small mammals, and put for example bird feeders into their gardens to attract them. For example, the RSPB (The Royal Society for the Protection of Birds), one of the UK's leading bird conservation organisations, sold its first bird nest boxes already in 1904 (RSPB, retrieved 2023). Gardening to attract wildlife therefore has a long history, but the promotion of gardening practices that are specifically targeted to improve habitats for native plants and animals in cities appeared around the 1970s (Mumaw et al. 2022, (Adams & Leedy, 1987). Wildlife gardening, especially in the UK, can be considered to be quite a big phenomenon nowadays and has changed gardening practices and ideas quite widely (RHS 2023).

The role of gardens and urban areas in conservation is increasing

In the context of urbanisation, the need, role and potential impact of wildlife-friendly gardening practices has increased significantly (Goddard et al., 2010; Davies et al., 2009; (Gaston et al., 2007) Biodiversity conservation in urban areas has a big role in minimising both the extinction of species and at the same time, the extinction of people's experience of wildlife (Miller et al., 2005; Goddard et al., 2010). With the urban environments growing and becoming denser, the role of gardens in providing green space and habitats in the city has become more and more important, as other green areas are either built full or paved and also designated green areas, for example, parks, becoming more managed and, with the growing population, more frequented. In addition, the role of urban areas as a whole in providing habitat for wildlife in general has also become more significant as the surrounding areas have also been significantly altered (Knapp et al., 2021): the cities themselves have grown in surface area but at the same time, also surrounding areas have become more and more impoverished through industrialised agriculture and building. The habitats have been fragmented and destroyed globally in general (IPBES 2019). The significance of urban areas as a habitat provider has therefore increased (Davies et al., 2009) and, as mentioned before, urban areas can function as a refugia for the species from these altered surrounding landscapes and provide resources for many species.

Despite the increasing recognition of the conservation value associated with private gardens, the body of ecological research supporting information on wildlife gardening remains limited (Goddard et al. 2010). According to Goddard et al (2010), this is first, because gardens were for a long time considered being ecologically poor and non-interesting. Also, according to the Wildlife Gardening Forum (retrieved 8/23), for example, most of the early gardening advice was not backed up by any scientific evidence and was “*based on myths repeated from book to book*”. The lack of scientific knowledge on gardens created an image that gardens are not very good habitats for wildlife. Secondly, researching gardens and garden biodiversity is challenging, as gardens are distributed in space, partitioned and privately owned (Goddard et al., 2010). Many classical ecological surveying tools do not work in urban areas, because of for example a lack of visibility and access to much of the land (Scott et al., 2014) Methods in cities include for example citizen science methods, participation and surveying, but all of these have their challenges, e.g. surveying biases in voluntary participation (Scott et al. 2014).

Not much is known about the motivations of wildlife gardening (Goddard et al. 2013) and comprehensive reviews of urban conservation literature have noted that more should be known about gardens as a space for conservation and, especially relevantly for this work, about fostering conservation behaviour by urban residents (Schwartz et al. 2014). Schwartz et al. (2014) underline that there is a mismatch between the growing body of research on urban conservation and the main motivations for actually conserving urban biodiversity: the knowledge is fragmented when it comes to what are the benefits of urban biodiversity both for the global conservation and the benefits for city residents. During the last 10 years, some research has been trying to reach out to this knowledge gap also focusing directly on wildlife gardening, its extent and motivations (e.g. (García-Antúnez et al., 2023; Gaston et al., 2007; Goddard et al., 2010; Mumaw & Bekessy, 2017; Mumaw & Mata, 2022) However, the comprehensive approach combining the knowledge production of conservation science to the production of guidance for the residents to use seems still lacking. Some research (e.g. Goddard et al. 2013) has gathered barriers and personal motivations to immerse in wildlife gardening, through questionnaires and interviews with residents. This research however mentions the sources where residents get their information to do that (e.g. the wildlife gardening guidance) only briefly. There is a lack of research on wildlife gardening guidance and the way it transfers the scientific research on biodiversity crisis and the potential impact of wildlife gardening to counteract that in urban settings, into practical guidance, digestible and usable for urban residents. All habitat management that is not based on scientific evidence, is potentially misinformed and even counter-effective (Wildlife Gardening Forum, retrieved 8/23).

Scaling up from gardens

Gardens as such are often relatively small, but they form interconnected networks (Goddard et al. 2010) and provide green corridors through the city, from one habitat to another. However, one garden is often too small to provide a full habitat to a species, and this is the reason why we need to observe the possibilities to scale up from garden management to landscape management. Goddard et al. (2010) have researched it and have some interesting suggestions, on how to incentivise more large-scale biodiversity conservation and land management. This is also one topic that we will look at more closely in our data analysis.

This combined with the increasing knowledge of the biodiversity crisis at hand means that the potential impact of wildlife gardening practices has grown from admiring the diversity of flowers and peaceful moments in the garden swing listening to birds into actual potential impact both to local wildlife, but also to a larger biodiversity crisis. Wildlife gardening obviously is not the key to solving all the biodiversity questions in cities. The garden as a unit is too small for the conservation of many species and there is a need for scaling up from garden management to landscape management (Goddard et al. 2010). There is also possibly a need for different kinds of top-down incentives to promote wildlife gardening (Mumaw & Bekessy, 2017), in addition to bottom-up, civil society initiatives that are common (Goddard et al. 2010). Also, it is important to notice that cities are different in their urban fabric, and the impact of garden management naturally isn't as big in places where the garden surface is substantially smaller. There is a need for conservation to focus on large, publicly managed areas, as species need those as well and as garden areas are naturally fragmented. It is also an interesting question, who can access the information and the financial resources to engage with gardening (Shaw et al., 2013)? Based on the literature, wildlife gardening can't be promoted as a solution for all biodiversity challenges, as it is clear that its impact potential has limitations.

2.5 Extinction of experience and (re)connection with nature: Leverage points for deeper sustainability transitions

“Extinction of experience” – losing connection to nature and wildlife

Wildlife gardening is a tool for biological conservation, but it is beneficial also for human individuals and communities of the area. It has a strong human dimension: it is about caring for the nature surrounding us but also practice and ethics towards the local human community (Mumaw & Mata, 2022). Wildlife gardening can provide meaningful moments for the people in their gardens, and create

health benefits and a sense of identity (Mumaw & Mata., 2022, McKay 2011). One central aspect in the wildlife gardening contributions to conservation, is the aforementioned “extinction of experience” (Miller 2005), the urban reality where residents do not have or have really limited experience of wildlife. Research has shown that the connection with nature is beneficial for human health (both mental and physical), relaxation and social interaction (e.g. Wolch et al. 2014; Rautio 2014; Lanki 2014; Roslund et al., 2020). In addition, research expects that without regular connection to nature, we might develop so-called “nature-disconnect”, which would decrease our empathy towards other species and make us less willing to support conservation, putting more species at risk (Shaw et al. 2013). Miller (2005) argues that: *“If there is to be broad-based public support for biodiversity conservation, the places where people live and work should be designed so as to provide opportunities for meaningful interactions with the natural world.”* This, they continue, would benefit both the well-being of humans but also protect species. Also Dunn et al. (2006) argue that the future of conservation may lie in the ability of urban residents being able to maintain their connection with nature. According to them, the importance of urban conservation for the survival of urban species has been acknowledged, but the links between urban conservation efforts and the success of conservation outside the city are not that much. They argue that the connection between them is the human-nature relationship.

Leverage points for sustainability transformations

These similar themes are present in more general sustainability science as well. For example, Abson et al. (2017) argue that even though there is currently a lot of focus on sustainability questions in both politics and science, the sustainability transitions are not happening, because humanity is not able to influence the actual root causes behind the unsustainability. Instead, the sustainability interventions focus on tangible but weak leverage points, on things that may maybe easy to do, but that do not have a deeper impact on the root of the problem (Abson et al. 2017; Riechers et al. 2021). Abson et al. (2017) draw their leverage point theory from Donella Meadows’ concept of leverage points (Meadows, 1999) which refers to the places in complex systems, that have a big “leverage” - where small changes could lead to a big change in the whole system. In her original publication, Meadows (1999) identifies ‘twelve leverage points’ which are variables in systems that can be modified to change the functioning of a system. The leverage points can either be shallow, leading to little systemic change when modified, or deep, fundamentally altering the entire system and its outputs. Deep leverage points have the potential to foster paradigm shifts as defined by Meadows (1999).

Based on their analysis, Abson et al. (2017) name “re-connecting humans with nature” as one of the key leverage realms, in the very roots of potential sustainability transitions. They argue that

“The functioning of a system is influenced by the degree to which humanity’s reliance on the natural world is acknowledged”. Humans interact with their surrounding nature constantly, and through these interactions grows a relationship of some kind, which in turn is seen as a deep realm of leverage (Riechers et al., 2021). Meadows (1999) mentions *values* as one of the deep leverages. Focusing on values becomes central when discussing human-nature relationships, and establishing meaningful relations and responsibilities, such as care, partnership or stewardship (García-Llorente et al., 2018). The discussion of values goes in line with what was stated earlier about wicked problems, their solutions being evaluated more based on values than function (Willamo et al. 2018).

As stated before, the prevailing view in industrialised societies is often that humanity is somehow separate or above the rest of nature and that view might be increasing due to the rapid urbanisation process (e.g. Lumber et al., 2017) when more people have less contact with other-than-human species. The connection to nature matters because it brings benefits for both humans and wider nature: in addition to well-being benefits for humans, high levels of nature connectedness have also been noted to correlate with pro-environmental behaviours, e.g. conservation behaviours supporting wildlife. (Lumber et al., 2017; Richardson et al., 2020) An interesting question in this research is does it work the other way as well, will supporting wildlife in the garden add the nature connectedness? The critique often is that connection to (the rest of) nature is a bit of a vague concept (Richardson et al. 2020). However, some research has come up with a measurable concept of nature connectedness (Mayer & Frantz, 2004). According to Richardson et al. (2020), *“the construct covers how we think about nature, our affective relationship with nature and the extent to which we see ourselves as part of nature.”* Some research has made an effort to identify pathways to nature connectedness (Lumber et al. 2017). It seems like education and knowledge-based activities are not enough of a way to increase the feeling of connection with nature, but contact, emotion, meaning, and compassion are predictors of nature connectedness (Lumber et al. 2017).

As stated earlier in this work, sustainability problems have to be dealt with framing them as wicked problems. The leverage point theory goes well with this: defining the point of leverage, the potential spot where changes could have a big impact is impossible if we are not able to look at the system in a comprehensive manner. An interesting question arising from the leverage point -theory for wildlife gardening is, that despite wildlife gardening focusing on tiny, very tangible actions (that we could maybe agree to hit only the very shallow leverages), will it as a whole, at the background of these tiny actions, without focusing on it, touch the deep leverage of human-nature connection? Has the actions of wildlife gardening potentially a lot bigger impact than it looks like when looking at only the goals that are said out loud?

3 HOW TO DIVE INTO THE QUESTION IN THE GARDEN :RESEARCH DESIGN

In this chapter, I will present the overall research design. Firstly, I will provide an overview of the data analysed to address the research questions. The chapter will describe the data and explain how the data selection process was conducted. I will also briefly introduce the main organisations that have produced the majority of the analysed data, giving the reader an understanding of their general nature and perspectives.

Secondly, I will present the methods of analysis. The theoretical framework, which supports the analysis and serves as the basis for coding the data, will be discussed in more detail in this section, building upon the literature review. The analysis involves both deductive coding, using pre-existing categories from the aforementioned framework, and inductive analysis of the framings. I will provide a brief explanation of these two coding and analysis approaches as well.

The overall aim of this research is to reach the answer to the questions by approaching it through the materials and informative events that are targeted directly to the residents themselves, the people who then actually would put it into practice individually on a small scale. This choice is made to be able to reflect on the guidance and the narrative they provide through the eyes of the city dwellers - assuming that they do not necessarily have a lot of prior knowledge on the topic or at least do not frequently update themselves with the most recent scientific research. This being said, this would mean that the way these organisations that are producing the guidance, the ones who are *transforming* scientific knowledge into practical advice, would have a big influence on the way residents see the biodiversity crisis and the motivations for them to act if we assume that the residents will “buy” into the narratives and framings.

3.1 Selection and description of the research location

Biodiversity conservation in urban areas is of course a relevant topic in cities all over the planet. Certain areas and cities are more relevant in this, both due to their action or inaction around these issues, certain types of urban development or due to the overall importance of certain areas in biodiversity conservation because of their natural environment (for example so-called biodiversity hotspots, chapter 3). The importance of action in specific locations also varies on a temporal scale, when for example multiple biodiversity loss drivers become stronger either globally or in a certain location (e.g. accelerated climate change or local destruction of habitats), when the city grows rapidly,

or even just on a local scale, when a specific plan affecting the urban environment goes through in municipal planning.

In this study, I will focus on the urban biodiversity conservation guidance in the United Kingdom and look at the topic, especially from the perspective of big, dense cities. The reason for choosing the UK as a geographical area to look at is both practical and topic-dependent. The urban fabric within the UK has a substantial presence of domestic gardens. Even cities like London are historically built in a way that even close to the urban core, there is a lot of garden space. 24% of the surface of London consists of private gardens (Smith, 2010). In other big British cities, like Manchester, the garden surface is similarly a bit above 20% of the city surface (Cavan et al., 2023). In a study conducted in the UK, the researchers compared five cities to determine the extent of the domestic garden surface and found it to range from 21.8% to 26.8% in the studied cities (Loram et al., 2007). In addition, in their randomised sample of at least 500 houses from each city, they found that 99% of the houses had some type of adjacent garden (Loram et al., 2007). This means that in the UK gardens make up a vast proportional area and as combined, form a big green space within the city. Consequently, we can assume that in cities like this, the way gardens are managed might actually have a relatively big impact - as we are talking about the management of almost a quarter of the city surface (Goddard et al. 2013).

Interestingly, despite the urban biodiversity conservation trends and increasing knowledge of environmental crises, the composition of gardens in London has changed significantly during the last 20 years and the size of the vegetated garden area is in a strong decline. That is due to for example new trends in decking and building sheds and other small buildings in gardens. Of the garden area in London, approximately half is vegetated, meaning that it forms approximately 14% of the green space of London. Between the years 1999 and 2006, the amount of hard surfacing in London's gardens increased by 26%, the area of garden buildings by 55% and the overall vegetation in gardens declined by 12%. (Smith 2010) Similarly in Manchester, only approximately half of the garden surface is actually green (Baker et al., 2018) According to the Manchester Metropolitan University research project, My Back Yard, this result is significant, because the city's green and blue infrastructure strategies rely on an assumption that all of the garden space is green – being able to estimate the amount of greenery the garden space offers, is vital (Cavan et al. 2017 in My Back Yard -action plan 2016; Baker et al., 2018). These changes are one interesting example of the changing landscape and phenomena that we are looking at and that the change is not necessarily going in the direction that we could imagine it going.

Within the context of the United Kingdom, there already exists a body of research concerning gardens and their management in general, but also from the standpoint of biodiversity, as elucidated in the literature review. Moreover, the concept of gardening for wildlife is more pervasive in the UK compared to numerous other nations, which makes it a good case for this research, particularly in

regard to the conservation guidance itself and the well-established organisations working in conservation, as it offers an abundance of material and data for comprehensive analysis. In addition, gardening as a hobby has a long history on the isles and is still popular among the residents, and done vastly across the socio-economic groups (Uglow 2004).

The examination of cities such as London, characterized by their vast size, high population density, and pronounced land use pressures, can offer valuable exemplars to other urban centres. Successfully addressing biodiversity conservation challenges in these urban areas holds the potential for multiple replication possibilities in other cities. While the British Isles themselves may not be considered a biodiversity hotspot or globally significant in terms of species conservation, it nevertheless harbours a diverse array of species. These above-mentioned factors collectively establish a good rationale for selecting the UK as a location for this study, even though I hope to shed light on the possibilities and logic of wildlife gardening promotion in other contexts as well.

3.2 Data and data selection

The data encompassing this study is structured into three distinct components, each of which will be subjected to analysis. The first component consists of the compilation of urban biodiversity conservation guidance and wildlife gardening advice documents, which are accessible online to individuals. The second component encompasses a range of wildlife gardening and biodiversity conservation events, offered both in-person and online, targeted at residents with an interest in these subjects. Lastly, a limited set of interviews have been conducted to complement and scrutinize the findings derived from the examination of documents and events, thereby serving as an additional source of information.

3.2.1 Wildlife gardening and biodiversity conservation guidance to residents: online documents

The data consists of documents that are in this research called “biodiversity conservation guidance targeted to residents” and “wildlife gardening guidance”. These documents are online materials advising individuals to act for biodiversity conservation in the space that they have control over, mostly in their gardens, but also on balconies, shared yards (e.g. in housing complexes) and sometimes in their urban surroundings in general. In the UK, these materials are produced mostly by non-governmental organisations that are either focused more widely on nature conservation or more specifically on the conservation of certain species or species groups, ecosystem types or biotopes or

certain geographical locations. All of the documents that are analysed in this research have been online and accessible for anyone without charge in February 2023. The extensive list of these guidance documents is in the Annex A. The materials differ widely from each other in their richness, specificity, target group and scope, and it is good to notice that the length of a single document varies between 1-30 pages. In this research, however, all the materials are analysed with the same level of detail. The guidance materials and the action that they try to encourage people to take is called different terms by different organisations. Most commonly the residents' biodiversity action is called *wildlife gardening*, *gardening for wildlife* or *gardening for certain species (bugs, butterflies, bats etc.)* but also *wildlife advice* or even *residential biodiversity enhancements*. All these guides are however similar in a way that they clearly represent the same thing and aim towards the same goals.

The data is selected so that it represents the majority of the wildlife gardening guidance targeted to the residents in the UK. The initial selection of the documents was done in the following way. Firstly, to cover the guidance that is targeted to residents in the capital, the guidance documents that are referred to in the most recent official environmental strategy of London (*London Environment Strategy*, 2018) were gathered. Secondly, to zoom in and cover an example borough level of the city, the guidance documents that were mentioned in the local borough level environmental plan in Hackney, East-London, (Massini et al., 2020 *Hackney Richer in Wildlife, A Local Nature Recovery Plan* 2021) were collected. Ensuring that there are materials mentioned both at the larger city level and also on the borough level ensures a larger scope of the materials, as the borough level in a big city is closer to the residents and therefore refers to a larger list of biodiversity conservation guidance documents. The environment or biodiversity strategies of other biggest cities in the UK after London (Birmingham, Glasgow, Liverpool, Bristol, Manchester) were looked through equally to see if they would mention more materials. Whether or not the mention in an official city document means that the residents would find it easily and use it, we cannot say based on this, but it gives some credibility to the guidance documents: the city indicating that those documents produced by that organisation represent the stance of the city. After these central documents were covered, a more extensive search online on wildlife gardening guidance in the UK was carried out to gather a bit larger sample of documents: testing what a city resident would most likely find online when starting to search for guidance for these issues. Search words combinations *wildlife gardening*, *gardening and biodiversity*, *biodiversity crisis gardening*, *gardening advice for nature*, *garden for wildlife*, *wildlife gardening guidance*, and *urban gardening wildlife* were used, and they led to a variety of materials. The search results were skimmed in a way that the documents chosen were from the UK and from established conservation/environmental organisations.

As mentioned before, a majority of the wildlife gardening guidance in the UK is produced by non-governmental organisations and so even the official environmental strategies of the cities often refer to

these third-sector documents rather than the city or boroughs would produce their own. The biggest and most established conservation organisations are well represented in the analysed documents, but also some smaller organisations have produced materials, that are referenced in the official city documents. Some of the leading conservation organisations in the UK are the Wildlife Trusts. Almost every area in the UK has their own independent Wildlife Trust focusing on its area and they all are part of The Royal Society of Wildlife Trusts, founded already in 1912. Together these 47 organisations form the Federation of The Wildlife Trusts. (The Wildlife Trusts 2023) The Royal Society of Wildlife Trusts has been for example one of the founding members of IUCN, the International Union for the Conservation of Nature, one of the most central actors in the whole global conservation effort and network. Many of the local Wildlife Trusts are producing their own guidance or at least they share the common Wildlife Trust - wildlife gardening documents on their websites for their members to find. The local organisations also produce events in their area and online, and for example on the scope of this research, events organised by London Wildlife Trust, Devon Wildlife Trust and Avon Wildlife Trust, were participated and analysed.

Another central actor in gardening for wildlife in the UK is The Royal Horticulture Society (RHS). The RHS is the leading gardening charity in the UK and some of the most comprehensive wildlife gardening guidance in the UK is provided by them. The RHS is an old organisation with more than 200 years of gardening behind it. It is focusing on gardening advice and is not necessarily originally a conservation organisation per se but has now during the last 10-20 years put more focus on “planet-friendly gardening” and on tackling the climate and biodiversity crises (RHS 2021, RHS 2023). The RHS and the Wildlife Trusts have a project together, called Wild About Gardens, which focuses on wildlife gardening advice. The guidance documents produced within that project focus on a large scope of actions and issues and therefore form a good portion of the documents selected for this research. The wildlife specialist from RHS was also interviewed for this research.

In addition, many other organisations and actors produce guidance as well. The more specific guidance is produced by organisations that are targeting smaller niches, topics and taxonomic groups within conservation. For example, *Buglife*, *The Bumblebee Conservation Trust* and *The Butterfly Conservation Trust* represent NGOs focusing on the conservation of insects. *The Bat Conservation Trust* focuses on bats, *The RSPB* originally mostly on birds, but still has most of the most typical wildlife gardening tips covered for other species groups as well. *People's Trust for Endangered Species (PTES)* is an overarching one and has a big collection of wildlife gardening advice for all kinds of species groups and biotopes. Then again, for example, *WWT (Wildfowl and Wetlands Trust)* focuses on the conservation of a certain ecosystem type, the wetlands, but gives guidance on how to produce this type of ecotype in a garden environment as well and is therefore also part of the

conservation organisations producing advice for urban environments, even though its main focus lies on ecotype usually not that typical in urban areas.

3.2.2 Wildlife gardening advice in the form of online and in-person events

The advice that the organisations are sharing on their guidance documents, is by many of the NGOs also shared in different types of online and in-person events. Many of them are available to anyone: there is no need to be a member of the organisation or to know anything special before participating. In this research, a chosen sample of events targeted to the general public are participated, observed and analysed. All of them deal with wildlife gardening, or, biodiversity conservation with a wider scope. The selection of the events is done so that every one of them would represent a slightly different angle to the topic. One event is an event for general wildlife gardening that describes the very basis of the issue (online, free of charge). One of them is more location-specific: wildlife gardening in London (in person in London, free of charge). One of them teaches the participant a specific tool to use in biodiversity conservation and for measuring the results (e.g. the results of the wildlife gardening in your garden): biological recording (in person in Bristol, a participation fee). One of them focuses on a specific species important to biodiversity, the bumblebee (online, free of charge for members). Lastly, one focuses on a specific action improving a specific ecological function, hedgerows for habitat connectivity (online, free of charge). All of the events take place in April and May 2023. Three events are organised online and two are at the organisation's facilities.

Event	Organiser	Date and location
Wildlife gardening - how we can all take action for nature on our doorsteps	Devon Wildlife Trust, Wilder Communities	12.4.2023, online
Introduction to Biological Recording	Avon Wildlife Trust, Grow Wilder	19.5.2023, Grow Wilder, Bristol, UK
The Wildlife Gardening Walk and Talk	London Wildlife Trust, Centre for Wildlife Gardening	20.5.2023, Centre for Wildlife Gardening, London, UK
The Plight of the Bumblebee + How to Help in Gardens Big or Tiny	RSPB and The Bumblebee Conservation Trust	9.5.2023, online

Hedgerows for Wildlife	Devon Wildlife Trust	9.5.2023, online
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In this research, these events will be analysed: what do they advise the participants (the content of the events) and how do they frame it (the narratives and framings)? In addition, field notes (notes and photographs) of these events and locations will be gathered while participating, and that will provide additional data to the research.

3.2.3 Interviews with conservation specialists within the conservation organisations

In this research, also a small number of interviews are conducted with specialists working on conservation in these conservation organisations that have produced the guidance documents. The interviews work as a support for the actual analysis of the documents. Through the interviews, I aim to understand the role of urban biodiversity conservation and especially of the wildlife gardening guidance in the organisation's work and what they think about the narratives and about motivating people to act in general. I'm also interested in what these conservation organisation employees think about the potential impact of wildlife gardening. The interviews were semi-structured and based on the preliminary findings from the document analysis and the experiences in the events. The interviewees were either present in the events as organisers or chosen based on their relevant position in these conservation organisations.

3.3 The methods and frameworks for analysis: two different “lenses”

Qualitative research can be done and approached in multiple different ways. I approached the selected and collected data with *coding*, following the guidelines of Saldaña (2013) in his book “The Coding Manual for Qualitative Researchers”. The data analysed were the guidance documents and event and interview transcripts/notes, as elaborated in the previous chapter.

Document analysis is a way to systematically review and evaluate documents. As a method of research, it is well applicable, especially to qualitative case studies. Document analysis is often used as a complementary method together with other methods and as part of triangulating the topic from different viewpoints with different methods. However, it can also be used as a stand-alone method. (Bowen, 2009)

The guidance documents and the field notes and transcripts from the events, as well as interview transcripts/notes, were coded in multiple rounds. In the analysis, I have two different “lenses”, through which I approach the data. I will explain in the following chapters how they were approached. For all of the coding, I used the qualitative data analysis computer software NVivo, which facilitates the categorisation of data and excerpts from the documents with “nodes” and “sub-nodes”, constructed by the user.

3.3.1 Lens 1: Taxonomic groups and species and the root causes of biodiversity loss

Analysing the content: how does the guidance address the root causes of the biodiversity crisis and which taxonomic groups are targeted with the action?

The contents of documents are analysed in a *deductive* way, meaning that the themes and codes that will be searched for in the documents are already defined in a research framework. That framework is presented in detail in the following section. It is based on the literature review, and combined knowledge of biodiversity research, ecology and conservation science. This approach is chosen because in this particular case, based on the research in these above-mentioned fields, we can make assumptions about which themes and categories “*should*” be found in the documents. We can expect the guidance documents representing the general research and knowledge in these topics and that they are just transforming it to a practical and more approachable form. The deductive approach and predefined categories make it possible for us to analyse how these pre-determined categories appear in the documents and also, to analyse if something is *missing*, something that based on the research on urban biodiversity conservation can be considered relevant.

Coding framework for the analysis

With this framework, I will analyse, which elements related to biodiversity loss and conservation are present in the urban biodiversity conservation guidance that is targeted to the residents in the UK. With the thematic analysis, it is possible to examine which themes are present, but also, which issues are maybe completely or partly lacking. This analysis will give us an understanding of which way scientific knowledge is transformed into practical guidance, and which issues are suggested to be addressed by actions of individuals, but it also gives us a possibility to examine and discuss which aspects are in the first place even partly or conceivably within the sphere of influence of residents. We can say that addressing the biodiversity crisis and therefore the actions of preventing or reversing can happen (at least) in two, also partly overlapping, ways. **The effects of biodiversity crisis on certain species groups** and possibly cascading effects of those effects: what effects does the declining biodiversity have and in which species groups do we see the effects first? An example of an effect on a

species group would be the decline of pollinators. The cascading effect from the disappearance of pollinators is the disappearance of certain plant species and then, over time, other species depending on those plant species. For humans, all this causes disturbances in food production which might then again lead to multiple effects, e.g. conflicts. For these, an example of a small-scale action at the beginning of this cascading stream of effects is the building of hibernation sites or a ban on pesticides. The second viewpoint could be the **root causes of the biodiversity crisis**: what are the issues that are causing the loss of biodiversity? For example, one of the root causes of biodiversity loss is habitat fragmentation. An action, on a small or big scale, is to increase the connectivity between green areas.

This said, this research framework has two sections, through which the guidance documents and their content are analysed. Those in this work are called 1. *Taxonomic groups and species* 2. *Root causes of biodiversity loss*. These two ways of approaching are based on ecology and biodiversity research and conservation science. They represent different layers in the comprehensive analysis. The first category tells us what is happening and to whom, now and in the future and tells us about the potential impact of wildlife gardening on direct conservation. The second tells us why and how can now affect the future, in different temporal scales and about the potential impact on the actual roots of the biodiversity crisis. In the next section, I will argue firstly why these two angles are relevant in general when assessing biodiversity conservation in urban areas. Secondly, I will describe how the categories within these approaches are chosen and why.

A. Taxonomic groups and species

This framework will analyse, how different living beings are taken into account in the urban biodiversity conservation guidance: what is the potential impact of it for direct conservation of species. As different groups and different species are differently affected by the biodiversity crisis, it is relevant to assess how the conservation efforts vary between the groups. For example in the animal kingdom, the toll of the loss in biodiversity isn't distributed equally amongst the different groups and some of them are the most hardly hit (e.g. amphibians). At the same time, we also have far less knowledge, records and sightings of certain groups (e.g. insects) and our understanding of their importance to the ecosystem function, of their entanglements with other species and of the level how endangered they are or even the number of species existing, is very limited. At the same time when it comes to urban settings, we know that some of the groups are more likely to adapt and even thrive in urban areas while some groups are more likely to suffer and disappear in cities. That means that the response to urbanisation also differs between the taxonomic groups and species. In addition, when assessing conservation, it is important to remember that conservation as a science and an action is something that is done by humans, so there is always a "human influence": whether this is always said

out loud or not, certain types of species get the “sympathy” more easily and that affects the conservation efforts. All these factors together make the assessment of taxonomy and species composition of the conservation guidance highly relevant.

However, even though in this work we are using this categorising of species, in multispecies thinking it is important to remember, that the boundaries that differentiate species from one another are not simply natural: they are also negotiated, actively made, maintained and subject to human interests and changing values (Benson et al., 2017) This holds especially when we think about categorising species into companion species and pets or pests, wild or domestic - defining those that are “worth” caring for.

Categories for analysis

Taxonomy is a highly specific branch of biology and in this work, there is no reason to go into great detail about taxonomy and the differences in the possible ways of division of species. The simplified and popularized version will give us enough detail to analyse the groups and species that are affected in the urban environment and the ones targeted with the conservation guidance. In this work, we are most interested in three of the existing kingdoms: **animals, plants and fungi**. This is because of their tangible nature in the urban setting, even though not meaning to imply that for example, bacteria diversity wouldn’t be an important aspect of biodiversity.

In biology, the animal kingdom is divided in many ways and has multiple levels of hierarchy. However, in this framework, we will use a simplified version for animals as well and divide the **animals** into **mammals, birds, insects** and **herpetofauna** (reptiles and amphibians.) In addition, we will have a category of “**soils**” (including fungi and microbes). For **plants**, this framework does not use subcategories but will go directly into the species level because in these groups the subcategories would be too specific for this type of assessment. **Fungi** we have added under the code “*soils*”. The reason to use these categories in this framework is that they are widely understood and create enough diverse groups for this kind of analysis, even though the taxonomic division, in reality, is not this straightforward. In addition, they are also categories that most of the residents could distinguish from one another and therefore provide enough specificity as we are analysing documents targeted to residents not necessarily with much prior knowledge on the topic.

Mammals	Birds	Insects	Herpetofauna	Soils	Plants
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All the selected data (urban biodiversity conservation guidance documents, events and interviews) will be analysed based on the categories of the framework. The materials are carefully analysed and coded with the above-mentioned groups. The guidance will probably also use species groupings more than species mentioned by name, which will help the coding process.

B. Root causes of biodiversity loss

With the second part of this framework, we will analyse which root causes of the biodiversity loss and crisis are addressed with the conservation guidance targeted to residents. As described in the literature review, biodiversity loss on this planet has multiple different causes, both indirect and direct. A shared feature of them is that they are all human-driven. (IPBES 2019) It is central to understand, whether the suggested actions of residents in urban areas in the first place address any of these drivers that are actually behind the biodiversity loss at hand and if yes, to understand which ones. Analysing this will give a possibility to open a discussion on how the drivers of the loss can, or cannot, be influenced by residents on small pieces of land, which root causes are the most focal in urban areas and to understand how close these drivers are to the sphere of influence of residents.

Categories for analysis

In biodiversity research, the main drivers of the loss are usually divided into indirect and direct drivers. Depending on the research, the number of drivers varies, but most often there are thought to be 5 to 7 most important human-driven biodiversity loss root causes. For example, the Convention on Biological Diversity (CBD 2006) describes the direct causes to be *habitat change*, *climate change*, *introduction of invasive alien species*, *overexploitation* and *nutrient loading*. These are mostly parallel to the ones of IPBES: according to IPBES (2019:16), the direct drivers with the largest impact are *changes in land and sea use*, *direct exploitation of organisms*, *climate change*, *pollution* and *invasive species*. One used division of main drivers can be described with the acronym “HIPPO” - letters standing for, and the threats in the order of importance, *habitat loss*, *invasive species*, *pollution*, *population growth* and *overharvesting*. These were used for the first time by E.O. Wilson in 2002. Based on these definitions, this framework will use the four categories in the table below. Some root causes are left out from the scope of this work (for example population growth) as it seems clear, despite being an important driver, that it is out of the impact scope of gardening in urban areas. Pollution and nutrient loading are in this case put together, accompanied by pesticide use as we can argue they somehow change the chemical composition of the environment.

Habitat change / fragmentation	Climate change	Invasive species	Pollution, pesticides and nutrient loading
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All the selected data (urban biodiversity conservation guidance) will be analysed based on the categories of the framework. The materials are carefully analysed and the conservation guidance will be coded with these above-mentioned four categories: to which root category does the guidance target to have an impact, if to any. All the conservation actions from all the documents will be grouped respectively of these categories.

3.3.2 Lens 2: Framings and motivations

Analysing the framings: How does the guidance argue for the residents' action in their gardens and frame the biodiversity crisis?

The second lens is looking at the framings present in the guidance. Descriptive coding is used for the analysis of the data. According to Saldaña (2013), descriptive coding is a good way to approach studies with a wide variety of data forms, e.g. documents, field notes and interview transcripts. In descriptive coding, the data is approached without pre-existing codes, but the documents are read while adding a word or a short phrase, that summarises the topic of a passage or an excerpt of the text. This can also be called thematic analysis: it is a way to analyse data and the patterns emerging within it so that the emerging themes become the categories of analysis (Fereday & Muir-Cochrane, 2006).

As per my research question, I am looking at the data and asking, what are the emerging ways how the guidance is trying *to motivate the residents to take action* and how it is *framing the biodiversity crisis*. Emerging excerpts of the documents and transcripts are coded respectively and divided into categories. On the second cycle of coding, more codes are created.

4 A WALK THROUGH THE GARDEN. WHAT DOES THE ADVICE TELL US ABOUT THE BIODIVERSITY CRISIS AND WHAT CAN WE DO IN PRACTICE IN THE GARDEN : RESULTS

The analysis of wildlife gardening guidance, in the form of documents and events, reveals an interesting realm of the possible impact of wildlife gardening on biodiversity conservation in urban areas and connecting it to the larger conservation as well. This section will present the findings obtained from the comprehensive analysis of documents, events, and interviews, walking the reader through the research process and mapping out the identified dominant framings and content findings within biodiversity conservation guidance and its potential use. Moreover, it establishes meaningful linkages between scientific research and the actions undertaken by individuals, the interplay between knowledge production and practical implementation. However, the implications of the results of this analysis will be elaborated more in detail in the discussion chapter, which will then aim, based on these results and this research process, to a comprehensive understanding of the intricate relationship between scientific knowledge, framings, and individual actions of biodiversity conservation in urban gardens to conclude, where the potential impact of wildlife gardening actually lies.

I collected the guidance documents the way described in the Research design chapter. I then used NVivo-software to code the data. The analysis methods and coding techniques employed in this study serve as the key methodological frameworks for understanding the underlying framings present within biodiversity conservation guidance. By subjecting the collected data to these analytical approaches, a deeper understanding of the prevailing discourses emerges, shedding light on their influence on conservation practices and initiatives. All of the data was subject to coding multiple rounds. The guidance documents were analysed first and I was then able to participate in the events with these initial results already at hand. These initial results also shaped the interviews and I was able to ask questions from the interviewees based on these findings. That added more depth to the conversations, and it was interesting to hear thoughts from the organisations behind these guidance documents and also the expert's reflections on the initial findings.

The chapter is divided into sections. First, I will present the events I participated in while conducting this research. After that, the chapter is divided according to the two analytical “lenses” (1. Root causes and taxonomy & 2. Framings and motivation) as described in the Research design. The findings under these headings are divided by the codes, and the actual findings, and they utilise and show examples of all of the collected data. As this study uses a comprehensive approach, the reader will notice the findings travelling between large and small scales, different temporalities, from individual to the city, and from the soil to the sky.

4.1 Wildlife gardening and conservation events targeted to residents and interviews

To comprehensively investigate and enhance the analysis of conservation guidance within the scope of this research, active engagement in a diverse range of events targeting residents and the general public was undertaken. To have these events as part of the research gives different insights, as contrary to the guidance documents, the events are interactive and allow participants to actively engage with the information. Participation in different events, whether online or not, still requires more effort from the participant. These events varied in terms of their thematic focus, depth of content, and intended audience, thereby encompassing a spectrum of prior knowledge levels. Additionally, disparities in accessibility were observed, with certain events being conducted online, while others took place in physical settings. As detailed in the research design chapter, the selection of events was intentionally conducted to encompass a multitude of perspectives on wildlife gardening, encompassing differing methodologies and angles of approach.

The events under study were promoted through online platforms. Each event description encompassed details regarding its nature, content, and objectives, along with biographical information about the speakers and presenters, as well as an overview of the hosting organization. Furthermore, the event descriptions provided clear instructions on how attendees could register and participate, including directions to physical venues or links to online meeting platforms. Some of the events necessitated a fee for the general public, while members enjoyed free admission. Events with external experts or with interactive workshop formats, often spanning a full day, often required payment and occasionally expected participants to have prior knowledge of the subject. Several of the events required participants to obtain online "tickets," primarily for registration purposes, without any associated costs. Consequently, it is evident that events that were free of charge, catered to individuals without much prior knowledge, and possibly those accessible via online platforms represented the most inclusive and widely accessible options for the general public.

The next chapter will provide a comprehensive overview of the events in which participation was undertaken within the framework of this research. The contents of these events were analysed alongside other data.

4.1.1 Description of the events

This table presents the events that were participated during this research, specifying the “angle” from which they approached their topic and the number of participants.

Event	Organiser	Date and location	“Angle”	Participants
Wildlife gardening - how we can all take action for nature on our doorsteps	Devon Wildlife Trust, Wilder Communities	12.4.2023, online	General	130
The Plight of the Bumblebee + How to Help in Gardens Big or Tiny	RSPB and The Bumblebee Conservation Trust	9.5.2023, online	Species-specific: Bumblebee	37
Hedgerows for Wildlife	Devon Wildlife Trust	9.5.2023, online	Function specific: connectivity	122
Introduction to Biological Recording	Avon Wildlife Trust, Grow Wilder	19.5.2023, Grow Wilder, Bristol, UK	Tool specific: biological recording	14
The Wildlife Gardening Walk and Talk	London Wildlife Trust, Centre for Wildlife Gardening	20.5.2023, Centre for Wildlife Gardening, London, UK	Location-specific: London	5

The online event titled *"Wildlife Gardening - How We Can All Take Action for nature on our doorsteps"* was organized by Devon Wildlife Trust, with access to all online participants at no cost, necessitating only online registration before the event. A substantial turnout of 130 individuals actively engaged in the event, reflecting the keen interest and enthusiasm surrounding the topic. The event addressed the basic principles of wildlife gardening, offering participants an understanding of the subject. The presentation was delivered by the leader of "Wilder Communities," a project initiated

by Devon Wildlife Trust. Throughout the event, participants had the opportunity to interact and raise questions through the chat and at the end of the event, a questions and answers session was held. The event provided all the essential information about wildlife gardening but didn't dig much deeper. However, the participants were active and enthusiastic and seemed like getting new, interesting information.

"Hedgerows for wildlife" -event was conducted by Devon Wildlife Trust, featuring an online format that attracted the participation of 122 individuals. Spanning 1.5 hours, the event offered a presentation delivered by representative from the Wildlife Trust. The presentation circled the pivotal role of hedgerows in fostering connectivity, emphasizing their significance in both rural and urban landscapes. In addition to the informative presentation, the event also included a dedicated question session towards the conclusion. This interactive segment allowed participants to actively engage by posing their queries via the chat function, but due to time restraints, the questions section was short.

"The Plight of the Bumblebee + How to Help in Gardens Big or Tiny" was organised by the RSPB (The Royal Society of the Protection of Birds) London group and they had invited a representative from the Bumblebee Conservation Trust to have a talk, especially targeted to the members of the RSPB London, but also open for others. The event was free of charge for RSPB members and cost 3 pounds for non-members. The talk was held in Zoom and had 37 participants online. The online event consisted of a presentation and a rather long Q&A session. It focused on bees and gardens in general, but it had a special geographical focus in London. That was partly because that is where some of the projects of the Bumblebee Conservation Trust are currently focusing, and also because the audience was expected to be Londoners, from the RSPB London group.

"Introduction to Biological Recording" was held in Bristol, at the Avon Wildlife Trust site called Grow Wilder on the 19th of May 2023. The workshop was a whole-day event, lasting from 9.30 until 16.30. The event was advertised online to anyone, also without too much prior expertise, but at the same time to people who would wish to work with recording: this changed the participant profile in a way that everyone was somehow skilled and had a bunch of knowledge about the topic already. There were 14 participants in total. The event was held by an ecologist and wildlife recorder specialised especially in bat recording. The event needed registration beforehand and cost 60 pounds for the participants. The cost is explained by these kinds of educational events being part of the Avon Wildlife Trust's fundraising. In addition, this specific one had an external instructor, outside the Trust.

"The Wildlife Gardening Walk and Talk," a nicely organised event, was hosted by the London Wildlife Trust at the Centre for Wildlife Gardening in London on May 20, 2023, just before the arrival of the summer season. This event, which aimed to engage and educate participants, was publicly advertised

on the London Wildlife Trust's website, ensuring its accessibility to all interested individuals. Attendees were required to obtain a free ticket in advance for registration purposes. Despite receiving 17 registrations according to the organisers, the event experienced a lower-than-expected turnout, with only 5 participants in attendance. This relatively small number was deemed atypical by the organisers, particularly considering the good weather on the day of the event. The event consisted of an informational presentation conducted inside the Centre for Wildlife Gardening, followed by a leisurely walk around the surrounding gardens. This interactive stroll allowed the gardener and London Wildlife Trust employee to showcase various aspects of the garden, including its diverse array of plants and wildlife. Furthermore, participants were informed about the ongoing work and activities carried out by the Centre for Wildlife Gardening within the garden's premises. The "The Wildlife Gardening Walk and Talk" event lasted approximately 1.5 hours, offering attendees a well-rounded experience that combined both informative presentations and practical exploration.

I approached the events as a regular participant to see and further analyse, what are the contents and information that the organisers share with the participants and analyse the narrative: how do they frame the problem and encourage the listeners to act. Compared to analysing the guidance documents, the events are different in the sense that the individuals that the presenters want to motivate to act, are present, and can interact with the organisers. Therefore these interactive dynamics make also the approaches and the choice of contents different.

4.1.2 Interviews

In the scope of this research, a small number of interviews and informal discussions with experts were undertaken to support the analysis of the data. The interviewees are anonymised but consist of experts from The Royal Horticulture Society (1), London Wildlife Trust (1), Avon Wildlife Trust (2) and a wildlife recording specialist (1).

4.2 Findings: Lens 1 - Root causes of biodiversity loss

The biodiversity conservation guidance documents, the contents and the field notes of the events and the interview transcripts were coded in the NVivo coding program for the root causes of biodiversity loss. As elaborated in the research design, the codes were designed beforehand, based on the literature and the body of research on biodiversity loss and its root causes. In general, all the chosen root causes and how to address them were found in the documents. Some causes were, as expected, more likely to be addressed. However, in general, the documents nor the events were not necessarily “fact-heavy”:

they would for example mention that habitat fragmentation is not good for wildlife and that it needs to be addressed, but the facts supporting this (what are the reasons behind habitat change and the future effects of it) were in general short mentions, if existed at all.

Habitat change / fragmentation	Climate change	Invasive species	Pollution, pesticides and nutrient loading
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4.2.1 Root cause 1: Habitat change and fragmentation

Habitat change and fragmentation was the most common root cause mentioned in wildlife gardening advice documents. As one of the main goals of wildlife gardening is habitat creation for wildlife in urban areas, this was as expected. The role of urban areas in creating habitats and cities functioning as refuges for wildlife in the context of habitat destruction elsewhere was strongly highlighted by the interviewees as well. The countryside surrounding urban areas was referred to as “depressing” and another interviewee emphasized the need to understand that the reality behind the city border isn’t pristine wilderness but in many cases the actual opposite. Habitat creation in the urban is therefore crucially needed.

The need for addressing the habitat change was mentioned and argued for in the majority of the documents and some reasoning for the ongoing phenomena and the increasing importance of gardens was also given. For example, for bats: *“As their natural habitats become more scarce, our gardens are playing a more important role in securing a future for bats.”* (Bat Conservation Trust. 2015. Encouraging bats) and for insects: *“Our insects are losing their habitat to urbanisation and agriculture, but a big part of the solution lies just outside your back door”* (Buglife. Wildlife Gardening. Gardening for Bugs) and *“Gardens are important places for moths, especially as intensive agriculture is limiting the number of suitable habitats in the countryside.”* (Butterfly Conservation Trust. Gardening for moths)

Based on the document analysis, the habitat change category was mentioned in the documents in three different ways: 1) creating habitats for species within a garden 2) linking garden habitats together to create ecological corridors and help in the general fragmentation of habitats 3) protecting habitats outside the urban area by making sustainable choices in the garden. All of these three ways of addressing habitat change and fragmentation are central, and it is a positive finding that based on the analysis, through wildlife gardening it would be possible to address all of them at least to some extent.

Creating habitats within a garden, creating habitats in the urban area

As stated in the literature review, one garden is rarely big enough of a habitat on its own for most animal species. However, for example creation of ponds is one exception: small aquatic wildlife can thrive within one pond, within one garden.

“Ponds greatly improve a garden's wildlife potential. Even small ponds can support a rich diversity of wildlife and provide places for animals to bathe, drink and mate.” (London Wildlife Trust. Garden for a living London)

The creation of habitats for plants can happen within one garden as well, as they do not move. This can happen either on the ground or on even the roof, maximising the space.

“Living roofs increase the planting area in your garden and provide extra wildlife habitat.” (London Wildlife Trust. Garden for a living London)

Also, creating nesting sites in the garden and the house was one way mentioned in the documents to add resources to wildlife, all the way from hedgehogs to bats. Also, the role of providing a variety of habitats to other species (prey) leads to the presence of other species (predators).

“A bat box is an artificial roost which is hugely beneficial to bats, offering them a safe place to live when suitable roosting sites are limited” (Bat Conservation Trust. Encouraging bats)

“Attract plenty of natural hedgehog food by keeping your garden diverse with a wide variety of habitats e.g. ponds, log piles, hedges, and a wide range of plant types. Don't be afraid to let your grass grow a little wild and leave some leaf litter – as both are important homes for the hedgehog's prey.” (The Wildlife Trusts & RHS. Wild about gardens: Get creative for hedgehogs)

Linking garden habitats together, creating ecological corridors

Creating city-wide habitats from small garden patches is central, if the possibilities of the garden green space to biodiversity is to be taken to its full potential. The guidance highlighted the importance of this, and emphasized, that the role of one garden is in relation to other gardens. In addition to just making the habitat larger, the need for connectivity was also argued from the adaptability perspective: if and when the environments change e.g. due to climate change, connected habitats allow species to move to more suitable areas and in this way to adapt to the change. Therefore, gardeners could also provide ways for larger-scale species movement.

“Think of your garden as a jigsaw piece, slotting in next to many other green spaces to provide wildlife with a ‘corridor’ in which to move around freely!” (The Wildlife Trusts. How to start a wildlife garden from scratch)

However, the guidance was slightly limited in the practical tips on how to make the connection between gardens stronger. Some advice included mentions of different types of choices in fencing. One of the events analysed, “Hedgerows for Wildlife” (Devon Wildlife Trust) fully focused on hedges and their benefits for wildlife and their chances of improving connectivity between habitats. Benefits of hedgerows were given for both rural and urban settings. Detailed guidance on how to make hedgehog-sized holes in fencing (“hedgehog highways”) was also given in the documents.

“Hedges are a better choice of boundary for wildlife than fences or walls, especially if native trees and shrubs are used. Hedges allow wildlife to move about between gardens and other spaces, and provide feeding and breeding opportunities.” (The Wildlife Trusts. How to make a hedge for wildlife)
“Help hedgehogs get around by making holes and access points in fences and barriers to link up the gardens in your neighbourhood.” (The Wildlife Trusts. How to create a hedgehog hole)

The guidance does address the need for cooperation between neighbours at the neighbourhood level, to “scale up from the garden”, but does not add a lot of practical tips on how to do that. For example, while advising how to build a pond in your garden, it is highlighted that *“a series of ponds in a neighbourhood creates essential corridors for wildlife to move”* (London Wildlife Trust. Garden for a living London) but tools for ensuring that there would be ponds in the yards of others, are not directly given. Also, the following quote asks people to work together, but how, that seems to be for the residents to figure out themselves:

“To save the hedgehog we need people to work together with neighbours to make small changes that will make a big difference. This is crucial because no garden or green space can help hedgehogs in isolation, but when they are linked together hedgehogs can thrive in any location.” (The Wildlife Trusts & RHS. Get creative for hedgehogs)

Different organisations do have different programs, where residents can for example mark on the map what they are doing in their gardens. According to the wildlife specialist of RHS, these might have more of a “motivational role” than an actual role in conservation. Also, the experts at Avon Wildlife Trust mentioned these programs’ role in bringing hope and motivation to the residents, when they can see that others are doing things as well. Connecting your garden with the neighbouring ones came up in the interview with London Wildlife Trust as well, suggesting that as gardens are so tiny, you should

connect them with neighbours. Ideally, someone would have a sunny garden, someone a shady one, someone a spring meadow, someone a summer one. However, they continued: *“I don’t know how anyone would coordinate that”*. According to RHS, one of the reasons why gardens have been an overlooked habitat before has been exactly this, drawing and facilitating connections between them is so difficult: even researching them is a huge challenge when the ownership changes with every fence.

Protecting habitats outside of urban areas by the choices in the garden

The choices made in the garden can also protect habitats outside the city. The best example of this in the guidance is relatively exhaustive advice on how to garden without using peat.

“Go peat free to protect the planet! --. This peat is dug out of wild places, damaging some of the last remaining peatlands in both the UK and overseas in places like Eastern Europe. Help preserve vital peatland by going peat free. – Sadly, more than 94% of the UK’s lowland peat bogs have been destroyed or damaged, and a wealth of wildlife has disappeared along with it. This vital habitat isn’t easily replaced.”(The Wildlife Trusts. How to go peat-free at home)

4.2.2 Root cause 2: Climate change

Of the root causes contributing to the biodiversity crisis, climate change is frequently highlighted in the guidance. In the context of climate change, gardens are described as having *enormous untapped potential for both people and wildlife* and especially in urban areas, *gardens will help reduce the impacts of climate change* (London Wildlife Trust. Garden for a living London). Wildlife gardening offers an opportunity for individuals to address climate change impacts, primarily through adaptation measures. While mitigation efforts receive less emphasis, there is recognition of their potential for that as well. Urban areas, in particular, can benefit from wildlife gardening practices that enhance ecosystem services, aiding in climate change adaptation. Therefore, ecosystem services were coded and identified from the documents together with climate change.

Climate change adaptation measures were at the core of the influence potential of the wildlife gardeners. Climate change was described as bringing more environmental problems and extreme events in cities and adding more vegetation and soils was presented as the main solution for counteracting and adapting (Bray et al. Raingarden guide). For example, rain gardens, a specialised way of building for rainwater runoff, were described in the guidance to especially target climate change adaptation through enhancing ecosystem services, for example, to *“help to reduce the effects of*

drought”, “*reduce our risk of flooding and curb urban heat islands*” and “*filter and clean runoff*” (Bray et al. Raingarden guide). Other guidance advised tree planting because it helps to prevent erosion and reduces the effects of flooding (Wildlife Trusts. How to plant a tree).

Climate change mitigation measures are not at the centre of wildlife gardening, but they are however present. In the guidance, residents are advised to plant trees: in addition to the other benefits “*six native trees will absorb and store about a tonne of carbon dioxide over their lifetimes*” (The Wildlife Trusts. How to plant a tree). Also ponds, in addition to their main role as creating a habitat and providing drinking water, will “*also store a large amount of carbon, helping to reduce the impact of climate change*” (London Wildlife Trust. Garden for a living London: How to make a pond). According to the guidance, gardeners can also have a role in preserving peatlands, which are major carbon storages globally, by not using peat in their gardens.

4.2.3 Root cause 3: Invasive species

Invasive species are recognised as a prominent factor contributing to the decline in biodiversity, and urban areas often serve as significant entry points for their introduction to the ecosystem (Borden & Flory, 2021). Gardens, characterized by a prevalence of non-native plants, often include a lot of decorative species that are not native, but not necessarily invasive either. However, the primary guidance documents analysed generally overlook the issue of invasive species and their management. While the guidance does emphasize the selection of native plant species whenever feasible, as it aligns with the principles of wildlife gardening to support local and native species, there is a notable absence of explicit guidance on addressing invasive species. Nonetheless, supplementary resources offering guidance on avoiding the use of certain invasive plants do exist (e.g. lists of already banned or avoidable plants). These resources, although not directly embedded within the wildlife gardening advice, are produced by the same organizations responsible for the analysed guidance documents.

The question of invasive species is nevertheless not simple, not anywhere, but not in the garden either. In the interview with RHS, this came up with the question of the scientific base of the guidance documents. The misconceptions around native, non-native and invasive species stick tightly. One of the events in which I participated in the research dealt loosely with invasive species by focusing on the tool of wildlife recording, which can be used for detecting invasive species. This was however not in the focus of the training and came up only by asking specifically about it.

4.2.4 Root cause 4: Pollution, pesticides and nutrient loading

In this root cause bundle, I focused on the topics that all change the chemical composition of the environment, plants and soils. These were not excessively present in the guidance.

The guidance focuses strongly on gardening without pesticides. Refraining from using pesticides is argued for by first of all that there is no need for it and that it also kills other species than targeted.

“Chemical pesticides kill non-target beneficial invertebrates including natural predators and so may do more harm than good” (Bat Conservation Trust. Encouraging bats)

There is a substantial amount of advice on how to replace pesticides with e.g. natural predation. That is argued that it is easy but also that natural “pest” controlling will bring new species to the garden. Frogs, toads and slugs – that all eat so-called garden pests – are described as “gardener’s friends” (The Wildlife Trusts & RHS. Wild about gardens)

For wildlife gardening, pollution can be prevented with some of the same measures as some other things as well (this is one of the most amazing things obviously in the whole wildlife gardening and global conservation as well – everything is a network and making something working better, will help with other things as well). Another thing arguing for pesticide-free gardening is the safety of humans. If people want to eat the products of their gardens, it is for better that they do not have remains of pesticides in them.

“Gardening without chemicals is a good way to ensure that the food and plants you grow are free of pesticides or chemicals, thriving without the extra expense of dangerous products that are harmful to our wildlife. If you’ve used chemicals in the past, this might sound like an invitation to every insect from miles around to chomp its way through your garden. But, with time and patience, you’ll end up with a rewarding, healthier garden for ditching the chemicals.” (The Wildlife Trusts. Chemical-free organic gardening)

4.3 Findings: Lens 1 - Taxonomic groups and species

The potential impact of wildlife gardening depends on the taxonomic group and the guidance targets different species groups differently. As addressed in the literature review and the framework, different taxonomic groups are differently affected both by biodiversity loss and urbanisation. Also, their presence in urban landscapes varies and therefore they are differently addressed in the wildlife gardening guidance. The selected species groups will be presented in the order of the amount of emphasis in the guidance.

Mammals	Birds	Insects	Herpetofauna	Soils	Plants
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4.3.1 Insects

“Pockets of the right plant life in our towns, cities and villages can be used by insects as they navigate our built environments.” (Buglife. Wildlife Gardening.)

A majority of the guidance focuses on insects and especially pollinators. This is in line with the current focus of scientific research, but especially the popular sciences focusing on the loss of pollinators. However, a positive finding was that the pollinator-friendly gardening advice was indeed focusing mostly on the protection of wild pollinators, and for example, suggestions on honeybee keeping, that you could have seen e.g. still a few years ago and still do see in more popularised science discussion, were completely lacking. Also, in the event “The Flight of the Bumblebee”, by Bumblebee Conservation Trust which focused on bee conservation, this came up as a question from participants, but in a way that the participants knew the answer already. The bee expert responded clearly that honeybee keeping is not the solution, but the opposite. In the guidance, pollinators in the garden can be mainly attracted by the choice of different plants (shapes and seasons) and this is easy and in the focus of gardeners. When it comes to pollinators, the common belief is that native plants are the best, and this holds in many cases. However, for example, the wildlife specialist of RHS described that their extensive wildlife gardening research concluded that a mix of non-native and native plants will provide longer blooming seasons in the garden, which is good for pollinators. In addition, building hibernation sites (so-called bee hotels) was covered in most of the guidance.

Other insects were largely covered in the guidance as well. Building an insect hotel, a leaf pile or leaf mould, mulch pile, stone pile, log pile or log pyramid were among the common guidance documents. Adding dead wood in the garden is, and was presented in the guidance, as an easy way to add habitats for insects in the garden environment. In addition, ponds provide habitat and drinking water for invertebrates and are therefore really important, especially in the cities crippled with heat waves and changing climate. All the insect-related guidance works well as wildlife gardening guidance because it is something that people can easily do but it is still an “activity” and also, it is easy to follow whether or not for example the bee hotel is used by bees or not. This gives the reward to the gardener as well.



Pictures 1-2. A bee hotel at the London Wildlife Trust's Centre for Wildlife Gardening in London (left) and an insect hotel at the Avon Wildlife Trust's Grow Wilder- site in Bristol (right)

4.3.2 Birds

Feeding birds is the most common wildlife gardening activity done in British gardens, done by an estimated 12.6 million (48%) households (Gaston et al., 2007). Birds for many people are the most commonly encountered wildlife in urban areas, as they are easy to spot and quite numerous in cities as well.

Bird conservation in urban areas can be addressed, according to the documents, events and interviews, in numerous different ways. The most common mention is providing additional feeding to birds, but that is not the only way. In addition, gardeners can add nesting sites by providing bushes for nesting birds and by building bird boxes. By adding all those above-mentioned features attracting insects into the garden, the gardener attracts birds as well by providing them a natural source of nourishment.

Birds are one of the obvious species groups, that do not form their habitat only within one garden and that is why the abundance of wildlife gardening activities throughout the whole urban area is crucial. The impact of these actions at the garden level on the abundance of birds, or bird species, is difficult to measure as the territories that birds use are large.

Birds, however, provide an easy way to connect with nature in the urban area and as stated in the previous chapters, we can argue that this, connection with nature can have a larger impact on global conservation efforts. Therefore, birds are an important species group to target with wildlife gardening guidance.

4.3.3 Mammals

Based on the analysis, mammals are well covered in the guidance. It is easy to understand why: mammals as relatively big animals are easy to spot and therefore rewarding species groups for residents to look after. One of the most tangible tools for urban mammal conservation, according to the guidance, is biological recording: creating databases of mammal sightings, also of the non-endangered ones, through citizen science. Also, the biological recording event and interviewees there emphasized the meaning of records and accurate species surveys.

The most present mammals In the guidance, and also In the events analysed, are hedgehogs and bats. Urban areas provide a very important habitat for bats and they live easily alongside humans. For bats, residents can build nesting boxes and also just allow them to live in attics and under tiling. The guidance and the experts in the events, encourage people to put a chair in the garden and just admire their feeding flights in the evening: *“get yourself comfy, have a little wine”* (Avon Wildlife Trust. Introduction to wildlife gardening -event). Guidance, and the events, also highlighted the diminishing of the prejudices that people might have against bats, which is important both for the conservation of that particular species, but again, from the connection to nature perspective as well. The event of Avon Wildlife Trust focused a lot on bats and gave a myriad of tips for recording, conservation and admiration of bats, e.g. where to go and at what time of the day. Probably the most sighted mammal in many urban areas in the UK, the red fox, was less present in the guidance than in the streets but materials on how to co-live with them do exist. Other mammals in the guidance were for example badgers, squirrels, martens and the endangered hazel dormice.

4.3.4 Reptiles and amphibians

The garden reptiles and amphibians can be given a helping hand, by making a pond or building a hibernaculum, a hibernating spot for them. There are only six native reptiles in the UK (PTES. How to make a reptile hibernaculum) and their numbers are declining. The event of Avon Wildlife Trust covered beautifully the specifics of doing wildlife recordings of reptiles and amphibians, from which

many are either protected or their habitats are protected by environmental laws. Many of the species can be found in garden ponds. Reptiles and amphibians, however, based on the analysis are not at the centre of urban biodiversity conservation through wildlife gardening, even though more potential could be easily seen, according to the interviews with experts during this research.



Picture 3. Learning materials about reptiles and amphibians at the Introduction to Biological Recording -event at the Avon Wildlife Trust's Grow Wilder- site in Bristol 19.5.2023

4.3.5 Soils, fungi and bacteria

Soil is obviously not a taxonomic group but is used here to combine all these things that are difficult to grasp, target and measure, especially by non-experts, sometimes experts included. There is more and more research available on the health benefits of healthy, living microbiomes, both for humans and for the global ecosystem health.

The guidance addresses soils, fungi and microbes, but only superficially and briefly. According to the guidance, soil health can be affected in the garden by using mulch, which controls the soil temperature, prevents erosion, reduces the need for water and nourishes the soil and through that, plants. Building up leaf moulds mixes decaying leaf material with fungi and aids with important

nutrients. Some of the guidance also states that a diverse micro-organism community will lead to healthy soil and from there, your garden grows better, tying this to the reward for the gardener as well.

4.3.6 Nature as a network

During the second cycle coding, I added a code “*nature as a network*”, to see how much the guidance addresses the inherent fact that everything in nature works as a network: helping out one species will automatically help other species in the web of life.

Nature’s network and connections were covered in the documents relatively lot. The guidance explains that making the garden suitable for insects will in turn attract birds and small mammals looking for a meal. Hedges will provide for insects, birds and mammals. In the soil community, microorganisms are stated to help plants. One topic in the guidance, how to get rid of pesticides, is especially good at underlining the connections, as relying on natural pest control is relying on nature’s network, diversity and predation: “*The more complex and varied your garden is, the more resilient it becomes.*”. (The Wildlife Trusts. Chemical-free organic gardening)

Only a few lines in any of the guidance addressed the role of humans in this network.

“*Bats are a sign of a green and healthy environment, so creating a garden that's good for bats will also be good for people.*” (The Bat Conservation Trust. Encouraging bats) However, none of the guidance extensively frames much about human-nature relations or frames humans as part of the network that they refer to. In the documents, the human stays as an observer of the garden.

4.4 Findings: Lens 2 - Framings and motivations

How do the organisations producing the guidance argue for the need and meaning of wildlife gardening? This section presents how the analysis of the wildlife gardening guidance documents, events and interviews reveal the emergent narrative framings in motivating individuals to act and their position towards the biodiversity crisis. The guidance argued for the need for action in multiple different ways. The analysis was started with the guidance documents, and the emerging codes (following the inductive descriptive coding) and the initial analysis of that was then used as a support while participating in the events and in conducting the interviews.

In the upcoming section, I will present the findings from the guidance documents, events and interviews, starting with the framings that were most frequent in the data. The findings are supported

by exemplary quotes from the data. These findings are discussed more in detail in the discussion chapter.

4.4.1 Framing the impact potential of wildlife gardening

The most present narrative in the guidance documents motivating people to act for wildlife is emphasizing the potential impact that their actions in the garden will have on conservation, both in the garden and also on a larger scale. This is done both by highlighting the potential of gardens in general and by referring to the extent of that area:

“There are over three million gardens in Greater London - 3,267,174 to be precise. That's an area of 37,942.09 hectares. In the face of climate change and habitat fragmentation, this massive expanse of green space has **enormous untapped potential for both people and wildlife.**”* (London Wildlife Trust: Garden for a Living London)

*“Britain is a nation of gardeners, and between us we have an incredible 16 million gardens covering two million acres. It doesn't take a lot to make your little plot of green a vital refuge for our invertebrate friends, and **the potential for all those millions of gardens is massive.**”* (Buglife. Wildlife Gardening. Gardening for Bugs)

Other documents highlighted the impact of the actions in an individual garden on the targeted species locally:

*“Nestboxes placed in gardens can make a real difference to the success or failure of a breeding **species in an area**, especially when accompanied by the regular supply of suitable food and water.”* (The Wildlife Trusts. How to build a bird box)

Emphasizing the impact potential and the relevance of these actions in gardens was highlighted by all the interviewees as well. Firstly, all the interviewees themselves seemed to genuinely believe in the impact of wildlife gardening. All of them did mention that its potential has limitations and can't be treated as the solution neither to the biodiversity crisis at large nor all challenges in the urban environment, but that as a combined effort, it has an actual, measurable impact. As formulated by the wildlife specialist of RHS:

“I believe that strongly. -- People making changes to their little space within an urban area. Individually, we'll have a little bit of an effect, but collectively could have a huge effect.”

Secondly, everyone highlighted the need to emphasize the meaning and significance of the impact when communicating with the guidance with the residents. Motivating people to act was seen as really important for the potential impact of all conservation efforts done by individuals. Interviewees thought that the possibility of making an impact is what makes people motivated to start and continue acting for wildlife. This was clear for example for the employees of the Avon Wildlife Trust, at the “Grow Wilder” site in Bristol. As the biggest motivation for people, the employees highlighted that the people want to know that their actions do have an impact. Creating a narrative, that focuses on the impact and meaning of the conservation act, no matter how small, was seen as the most impactful one. This is in line with the results of the document analysis: the guidance tends not to have a lot of mentions about the bigger scale crisis or the threat that the biodiversity loss is putting on us, but more about small steps and the impact of those actions.

At RHS, they emphasized that the impact potential goes hand in hand with scientific research: the guidance must be backed with reliable scientific research so that the residents can trust that the actions that they are encouraged to do are actually impactful and scientifically sound. This was also seen as difficult, as the garden biodiversity research is still relatively small and assessing longer-term impacts takes so much time. These types of long research projects are also expensive. The RHS Wildlife Specialist elaborated that the knowledge of these impacts and actions is getting a lot better than it used to be. According to them, still for example 20 years ago there was more inaccurate information and guidance, that kept being repeated, without backing from any ecological research. The RHS conducted a longer study, as they felt there was a lot of unsupported advice going around. According to them, it is easier to back their guidance with this research and therefore motivate people, as the proof of the potential impact can be presented.

Highlighting the impact potential was present in all of the events as well: most of the advice given was backed with information as to which species or other cause a certain action would have an impact and how. For example, in the event on wildlife recording, the first part of the whole day event was used in arguing for the importance of the records for conservation and the impact and importance of the records done by individuals was highlighted numerous times. I asked about this from the instructor later, and he concluded: *“I want to give people the feeling they are contributing – because they are”*.

4.4.2 The impact is built by little, little steps

As a continuation of the impact potential, the second most present narrative for motivating the residents was presented in a way “that every little helps”. I used two codes to analyse this, “easiness” and “every step counts”, but merged them later on as they overlapped. Basically, all the guidance

documents encouraged the gardener by emphasizing how easy it is and how small actions have a huge impact. The guidance also highlighted, that there is no need for massive gardens, but *“no matter how big the space you have”* (Wildlife Trusts. Grow wildlife-friendly herbs), there is impact.

This was mentioned a lot in the interviews as well. The interviewees pressed the importance of “entry-level” actions, something that anyone could start with. They also emphasized how important it is, that even though the person would only be able to do one little thing, they should be able to feel proud of it and not discouraged, because they are not doing more. Especially changes in gardening practices, that are significantly different from the “conventional”, were seen as taking quite a while to be taken by the people. One of the interviewees also wanted to highlight the conditions of people, especially in London, explaining why easy actions are important:

“I guess people are so pressed, aren't they? The cost of living is so high. They're paying massive rents for their houses and they're working all hours. Maybe they just don't have time to think about it, they just want to do something easy.”

The easiest way to wildlife garden is to just let your garden go wild: not to do anything. Stop mowing, stop cleaning the autumn leaves away, and stop interfering with the life of the critters. This advice comes up in most of the guidance and the majority of the events. Here formulated by Butterfly Conservation Trust:

“One of the easiest ways to make your garden better for moths is simply to stop working so hard!”
(Butterfly Conservation Trust. Gardening for moths)

4.4.3 Reward for the gardener

Much of the guidance argues that the actions are *“both people and for wildlife”* (The Wildlife Trusts. Grow wildlife-friendly herbs) and *“for you, as well as for wildlife”* (The Wildlife Trusts. The Wildlife Trusts' Guide to Wildlife Gardening). How wildlife gardening will be rewarding for the residents themselves, is clearly one of the main ways to activate residents in wildlife efforts. Most often the reward in the guidance is tied to the beauty that the wildlife gardening brings to the space and the interesting visitors that the gardener can then observe. Some rewards were also more practical: for example, shade and windbreak provided by the planted trees. Some of the guidance mentions the reward directly: *“Gardening with butterflies and moths in mind is one of the most rewarding things you can do in your own backyard.”* (Butterfly Conservation Trust. Gardening)

The most present reward mentioned is the possibility to observe the wildlife arriving at the garden: the guidance invites the gardener to enjoy the results of their work, to admire the visitors and enjoy the

beauty the plants bring, the scents that the flowers spread around and buzzing and sniffing of different species in the garden.

“Add a seat, put your feet up and watch your garden come to life!” (Bat Conservation Trust. Encouraging bats. A guide for bat-friendly gardening and living)

The reward came up strongly in analysing the events and interviews alike. In the biological recording event, a big part focused on the admiration of wildlife. The instructor for example encouraged the participants in bat spotting, advising on what time of the day is the best to be out in the garden, to take a seat and be amazed by them flying past. According to the Avon Wildlife Trust employees, in their work, the reward plays a big role in motivating people. They also emphasized that it is relevant that this reward also arrives with a relatively short timescale.

4.4.4 Links to larger-scale conservation

Gardens are described as urban units, but the impact can be felt outside the garden and even outside the city boundaries. According to the documents, the gardens are linked with each other and with nature reserves and countryside. These linkages in the guidance back up the guidance convincing the residents that their actions have influence even further away. More about linking the garden to the larger scale conservation was also presented in the previous chapter of root causes, under habitat fragmentation.

The Avon Wildlife Trust employees mentioned that one of their tools, similar to other organisations, is a Wildlife Trust project where you can mark on a map the actions that you’ve done. This is meant to encourage the residents when they see that others are also acting. This type of project was mentioned in other interviews as well, both from the perspective of motivating people by telling them that they are not alone, but also as a tool for connecting the actions done in individual gardens to larger landscape management. As this is one of the central things when it comes to urban biodiversity conservation, how to “scale up from a garden”, it is interesting that these mapping tools and interactive ways of sharing could potentially have an impact by both motivating the individual but also creating a bigger impact, as we understand that the conservation, to be more effective, should happen on a larger scale than one garden.

4.4.5 Urgency, loss and crisis are almost missing in the guidance

This code was partly emerging from the materials, but also something that I would have wanted to add in second cycle coding if it wasn't about to emerge. How much does the guidance focus on the biodiversity loss as a crisis, as a threat, as a loss and how does it argue for the urgency of the actions? Considering the context where we are (in the middle of a biodiversity crisis) and what the wildlife gardening guidance is for (turning the situation around), the words loss, crisis and extinction come up rarely in the guidance. The “strongest” expressions in the advice are for example “ – *they are under threat from the loss and degradation of our habitats due to pressures such as development, agricultural intensification and climate change*” (The Wildlife Trusts. How to attract Bumblebees into your Garden), “*--are threatened*” (RHS & The Wildlife Trusts. Wild About Gardens: Stars of the Night), “*--in decline*” (Wildlife Trusts. How to build a bird box) or “*--are in trouble*” (RHS & The Wildlife Trusts. Wild About Gardens: Get Creative for Hedgehogs). The Peoples Trust for Endangered Species uses maybe the most powerful expressions, stating for example that “*Many British species are declining and face a high risk of extinction -- you can help us protect those that remain before it's too late.*” (PTES. My Garden)

I brought these initial results to the interviewees and asked for their opinions about the lack of *crisis* in this crisis. Interestingly enough, they didn't see it as much of a problem. The Avon Wildlife Trust employees emphasized that humans are not able to function from a state of fear and therefore from their perspective, it is good not to talk too much about the crisis. The London Wildlife Trust was also in favour of positive messages. RHS had thought this further: for them, they see that people are relatively well aware of the environmental crisis and therefore wouldn't need to “*be hit over the head with that information*”. People are doing gardening mostly because it gives them enjoyment and fulfilment. They do not necessarily have a clear argument in their minds as to why exactly they are doing the wildlife-beneficial changes that they are doing, but “*they know it is the right thing to do*”. In general, according to RHS, there has been a visible shift in how gardeners around the country relate to the other living species in the garden and a shift in practices. However, they also see that it is important that “entry-level” practices and changes exist, and not to give these people the feeling that they wouldn't be contributing, because, according to RHS, they still are.

Interestingly, also the responsibility to act came up only in a few guidance documents. Almost the only mention was this in London Wildlife Trust's materials:

“*We all have the power and responsibility to make a huge difference.*” (London Wildlife Trust. Garden for a Living London)

Based on the analysis, appealing to moral responsibility to make changes in the garden is not the way for the organisations to motivate people. This can be considered surprising in the light of general public discourse about different environmental crises, which revolves a lot around the responsibility of individuals.

4.4.6 Care and connection to nature

On the second cycle of coding the data, I decided to look at it differently, looking for the elements of care and connection to nature. In this case, especially the so-called *multispecies care* (Benson et al. 2017), care that goes beyond the species boundaries. Many parts of the advice can be considered as encouraging care, and this is central: the actions done in the garden come somehow through care, caring for the plot of land and caring for its other inhabitants. It might first seem that the *care* codes would be under the *reward for the gardener*, but through the analysis, it draws a deeper picture: the reward is something bigger than the exact moment when the gardener gets to admire the results of their work (bumblebees foraging on the plants the gardener planted, bats whooshing from the attic, birds visiting the birdfeeder), and it does have deeper elements behind it. The advice goes in line with the theory of nature connectedness. This will be elaborated on in the discussion chapter.

These themes came up strongly in the interviews. The interviewee in Bristol started with a fundamental question: for whom is conservation? Connection to nature and participation in conservation could be and should be, for everyone and maybe some of the potential in urban conservation lies in the inclusion of more diverse groups in conservation. The interviewee called out the exclusion in conservation science: it was seen as fancy and middle-class. For them, for example in certain habitats, the local farmers or local fishermen would have amazing knowledge of the local wildlife, as they spend enormous amounts of time in the environment. However, this knowledge is often neglected, as it is not “scientifically” collected: *“We should recognise the knowledge that exists, it comes in many different forms”*. His aim with the training events that he was instructing was to encourage people to participate: *“I want to give people the feeling that if he could do it, I could do it.”*

Also, RHS in their interview emphasized the importance of making people care. The RHS is focusing more and more on encouraging people to observe, try out different things and *“become their own little, sort of their own scientists”*. And this is not only because these observations could be useful, but the observational interaction might lead to something else: *“Often it means that they will learn more, see more, and therefore **care more**. -- and if you care more, you're more likely to protect it”*. From the perspective of RHS, they are in addition to changing the gardening practices, changing also the people’s way of seeing the world: *“Yes, it's about changing practice to some degree and what's going*

on in gardens, but it's about changing people's appreciation and understanding because if people feel really connected and they discover something, they see something, or they take part in a survey and then they feel rewarded by that and they feel that their information is going to a good cause. Then they know that they've helped in making bigger change."

Also, the London Wildlife Trust saw its role in encouraging people and also, educating them about the environmental crisis. They want to teach children and adults alike what is happening, what they can do to help *"and to love wildlife as well."*

5 ON THE SEARCH OF THE RADICAL ROOT: DISCUSSION

What does all of this mean, in the garden, for the gardener, for the city and the global conservation effort? This chapter will discuss the findings, and tie them back to the larger scale, which will shed light on the findings in an interesting way, how are the little gardens and gardeners linked to the overall topic of biodiversity conservation and crisis and what could we think about this interwoven reality.

In the end, it seems like there is a huge potential impact in wildlife gardening: both regarding certain species that we want to conserve in urban areas and also, almost a bit surprisingly, there are links to the actual causes and drivers of biodiversity crisis as well. **However, it seems that the supposed purpose of wildlife gardening, the direct conservation, has an important but rather limited potential. Instead, there is enormous potential in shifting awareness and supporting the reconnection with nature, which in turn can be considered as a deep leverage point and a prerequisite for real systemic change.** In addition, the real impact is not just in connecting individual residents to their piece of land and their surroundings and therefore enhancing their understanding of the web of life as an interconnected network and valuing their part in that system, but also in connecting people and their plots: if it is possible to scale up from garden level to the neighbourhood level and to the city level, we are looking at enormous potential in both actually combining habitats (and therefore in real conservation value) but also in bringing people and their collective shift in thinking together.

In this discussion chapter, I will first discuss the findings of the first lens used, the impacts to direct conservation of species by taxonomic groups and the root causes of biodiversity crisis. I will then dig deeper into the topic of nature connection and deep leverages through the framings (lens 2) to discuss how can this be considered as a prerequisite for systemic change and therefore the spot where the real impact of wildlife gardening actually lies. We will also look at urban conservation more broadly: what do we conserve when we conserve and how does this tie to the care across species?

5.1 Impact on direct conservation of species

In the guidance, the act of wildlife gardening is “sold” to the residents with the idea of protecting the species: in practical terms, all of the actions in the guidance whether building a pond for amphibians or a log pile for stag beetles are aiming in providing resources specifically for something or someone: species or individual creatures. The guidance does highlight the importance, impact and meaning of

these actions in direct conservation and on the scope of this research, also all the conservation specialists working on this topic seem to believe these actions have a real impact on actual conservation. The analysis of the presence of different taxonomic groups in the guidance supports this: basically, all taxonomic groups examined are present in the guidance and based on this, we can say that there is something that an individual resident can do on their piece of land for all of these groups. The conservation that can be done in the garden is not able to, however, often support or protect rare species that are at risk of extinction, as these usually demand big territories or special habitat types. It is therefore clear, that the protection of these species (and habitats) has to happen elsewhere than in urban areas or garden spaces. However, as stated before, also common urban species from bats to starlings are in decline and these are the species that urban conservation efforts can actually influence.

Even though all of the species groups examined are present in the guidance somehow, not all of the groups are equally represented, and it also seems like some that could be relatively easily affected by the residents in the garden are, if not completely, at least partly lacking. For example, the lack of advice covering the themes around healthy soil is something that could be added easily and could have a big impact in multiple different ways than just biodiversity. As mentioned before, research is popping up in multiple countries about the importance of contact with soil microbiome for human health (see e.g. Roslund et al. 2020). Encouraging and enabling residents to be in direct contact with the earth could have a big impact to overall urban health, as being exposed to soil microbiomes is connected to multiple health issues, all the way from mental health to preventing auto-immune diseases. In addition, in the context of climate change and urban areas being extremely vulnerable to extreme weather events (see e.g. IPBES 2019), regulating services provided by soils when it comes to flooding, have a role that cannot really be replaced by any type of human-made infrastructure. This has both economic impacts and especially in some areas, health impacts as well. The well-being of soil can be improved with some of the actions mentioned in the guidance (e.g. giving up on pesticides, even though bans on pesticides should be done more on a global scale and not letting individuals decide on this) but the benefits of this could be explained more in detail. For the climate adaptation measures, the importance of the *amount* of unpaved and open soil should be emphasized, especially when research shows that the percentage of green space within gardens in the UK is actually declining, not increasing (Smith 2010).

The species groups most covered in the guidance are the groups that the residents would know the best: mammals, birds and insects. There are actions that individuals can do to provide resources to these species and therefore enhance their potential for survival in the city. However, the focus on these familiar and visible animal groups supports the conclusion that one outcome of the guidance is also the connection of the gardener with their surroundings: almost all of the guidance does encourage the residents, after doing these actions, to *sit back and admire* the creatures that then appear to their plot.

Whether or not the appearance of hedgehogs in the flowerbed is important per se, or does the meaning lie in the act of the human watching that nightly sniffing routine around the garden can be debated of course, but seeing wildlife going on their own business does hit exactly to the goal of connecting with nature and therefore it makes sense to focus on visible and familiar species groups.

One of the central species groups impacted by the wildlife gardening efforts is pollinators, which is understandable both because of their alarming decline and the growing body of research on their importance and because of their visibility in general media. What makes pollinators interesting in the urban setting, and very fitting to the topic of wildlife gardening in cities, is that pollinators are one of the species groups that actually do better in urban areas than in surrounding (agricultural) landscapes - the number of bees, for example, being in many cases higher in the city compared to the surrounding countryside (e.g. Buchholz & Egerer, 2020; Normandin et al., 2017; Tommasi et al., 2004). Therefore, this gives food for thought for urban areas functioning as refuges for species but also ideas for practical implementations for example in urban food production: we might have more pollinators within cities than in the farmlands where the food is produced for us. In turn, research has shown urban community gardens being especially diverse in bee functional traits, and therefore able to support a lot of diversity (Normandin et al. 2017). Thus, the abundance and variety of resources for pollinators in urban areas – to which wildlife gardeners contribute - can have a larger impact on the overall sustainability and resilience of cities through food security as well. This as a result is one meaningful potential impact of wildlife gardening as well.

5.2 Impact on the root of the crisis

The potential to impact the actual *roots* of the biodiversity crisis with wildlife gardening is for sure limited, but somehow existing. Looking at the roots is important for multiple reasons. If we want to approach all of this comprehensively, we need to deal with different scales. When we approach the root causes, we are turning our gaze from the actual garden both temporarily (root causes of the biodiversity crisis preceding, *causing*, the biodiversity crisis) and also spatially (root causes are happening somewhere else than in the garden itself). Looking at root causes is therefore widening the scope from the effects to causes, and quite clearly, if we want to solve this mess, we have to walk backwards our steps and see where all this rubble comes from.

Based on the analysis of the guidance, the root causes that wildlife gardening mostly addressed were climate change and habitat destruction. Even though these have some importance, it is relevant to notice that the actual root of the crisis still lies somewhere unapproachable by the gardener.

Yes, wildlife gardening is affecting habitat destruction by creating and connecting habitats, but the reason why suddenly urban habitats are so important and meaningful for species in the first place is habitat destruction elsewhere. This means that habitat creation in urban areas is another solution to fix habitat destruction happening somewhere else and doesn't affect the root of the problem which is the intensive agriculture, industry and infrastructure that is wiping out all the places for other species to thrive. This same holds for climate change efforts: wildlife gardeners have an impact on climate adaptation measures in the urban area, but the cause of climate change driving species to extinction lies somewhere else. While climate change mitigation efforts in the garden are, sure, mitigating climate change, it is clear that the importance of carbon storage at a garden level is too small to make much of a difference. Invasive species and their potential spread to alter ecosystems is actually one of the only root causes where the garden and the city might be actually the source of these invasive runaways: therefore, this is where we are actually somehow close to the root of the issue. However, as mentioned in the results, invasive species were hardly mentioned in the guidance. This is where the guidance is for sure missing a potential chance for impact.

5.3 Potentially the deepest root: reconnection with nature as a deep leverage

It seems like wildlife gardening has enormous potential in shifting awareness and supporting the reconnection with nature, which in turn can be considered as a deep leverage for sustainability transition and a prerequisite for a real systemic change. If we agree with Abson et al. (2017) that reconnecting with nature is one of the biggest leverage points in sustainability transitions, we can agree that wildlife gardening has the potential to promote these transitions. It seems like fostering a human-nature connection is at the very core of almost all of the wildlife gardening actions: the guidance encourages the gardener to love, cultivate, nurture – to care – for the multispecies companions appearing in their plot. There is an abundance of guidance focusing on the best ways to admire nature, describing the natural wonders, the meaning of them and the ways for the gardener to get involved. These support the development of nature connectedness.

As stated earlier, research in environmental psychology shows that nature connectedness can be fostered intentionally. The pathways to nature connectedness described by Lumber et al. (2017), serve as a typology of activities for a methodological approach to improving and reviewing human-nature relationships. According to Richardson et al. (2020), these can be used in designing activities for individuals, nature engagement programs and beyond. Some of the environmental organisations whose work has been examined in this research as well, like the Wildlife Trusts, have used these frameworks in some of their campaigns. The recognised pathways to nature connectedness seem to fit wildlife gardening practices and goals well. The research of Lumber et al. (2017) recognised five types of

activity linked to nature connectedness: contact through the senses, emotion, beauty, meaning and compassion. Especially compassion (“*caring and taking action for nature*”), contact through senses (“*notice and actively engage with nature, spending time fully experiencing nature with all their senses*”) and beauty (“*noticing nature’s beauty*”) (Richardson et al. 2011) are all in the very centre of wildlife gardening and go in line with the analysed data in this thesis. In the analysis, the framings in motivating the residents were encouraging active engagement through different activities and admiration for nature’s wonders and beauty. The whole point of wildlife gardening is to take action and care about nature, and based on the theory, this *compassion* is a clear pathway to connectedness. Solely relying on educational activities and knowledge sharing does not seem to increase nature-connectedness (Ernst & Theimer, 2011). As stated earlier, the guidance wasn’t centred only on facts or “education”, which can be interpreted that it is, first of all, focusing on increasing nature connectedness and not on teaching people about nature or the loss we are facing. This came up in the interviews as well: people were thought to know already enough, and now they would only need some encouragement.

Coming back to Meadow’s (1999) leverage point -theory, we can argue that the real consequences of human-nature relationships come only through a real paradigm shift and societal change. Therefore, the potential societal implications of nature-connectedness are something more than the pathways theory just informing how to do successful environmental campaigns. If there is to be a real shift in collective thinking, it might come through individual experiences and individual connections to nature, but the key here is that it has to be a *collective* shift, counteracting the *extinction of experience* not just on an individual level, but on a societal level. This can then have a real significant impact on a deep leverage realm. Based on the analysis, it looks like wildlife gardening actions have all the potential to hit this leverage. So even though the suggested impacts of wildlife gardening in direct conservation may seem, if examined with Meadow’s 12 leverage points, quite on the shallow end of the sliding scale of leverages, through the nature connection, the impact is bigger than it seems.

5.4 Shifting baselines, protecting lifeways: What we decide to conserve

But what is the role of nature connection when it comes to global conservation efforts? Much of the literature focusing on the extinction of experience and nature connection goes as far as claiming that “*the future incentive for conservation will depend increasingly upon people’s interactions with urban ecosystems*” ((Dunn et al., 2006). This obviously might or might not be true. However, based on research it seems to hold that the feeling of nature connectedness does increase the likelihood of pro-environmental behaviour and that nature connection increases with the amount of real, hands-on connection with nature and wildlife ((Richardson et al., 2020) Therefore drawing the link from nature-

disconnected urban dwellers that do not have experiences of wild things to declining efforts in conservation seems logical. The other question is, how much in reality and on a global scale the feelings and opinions of urban residents on the need for global conservation will affect the actual conservation efforts of governments and international bodies?

However, it is certain, that we tend to conserve and advocate a cause that we personally consider important. In ecology, a meaningful issue that ties together care, connection and conservation, is the so-called shifting baseline syndrome (Sinclair et al. 2018). When we conserve something, we need to decide what is the “natural” state, the baseline, that we are aiming to. Around the globe, there are multiple conservation projects ongoing that are protecting for example traditional farmlands by bringing in cows or other browsers, to keep the areas open for the species that demand a certain type of traditional agricultural ecotypes. However, this ecosystem type is already a result of human activity in the area, and not the original, or natural state. In urban conservation, it is obvious that while we are aiming to rewild the city, we are still not letting go of the city being a city, even though obviously that is not the natural state of things in that area. When it comes to rewilding, who gets to decide how far we are going to go and what is “wild” enough? Donna Haraway phrases it in her book (Haraway et al., 1997): *“The point is to make a difference in the world, to cast our lot for some ways of life and not others”*. This in this case can be interpreted that even within conservation, we make decisions in what we are conserving, what are the lifeways we are protecting and what is the baseline we want to “return” to. Similarly, the choice of species we focus the most has a human influence: to put it bluntly, the conservation of the cute and beautiful is the easiest.

Shifting baseline syndrome means that our expectations on conservation and environment change, the baseline that we are comparing the current state of the environment shifts. The environmental degradation during the last 100 years has been so fast, that we are losing the experience of how things were. Are we the last generation that will remember how it feels like to have snowy winters or summers without heatwaves or to see starlings in the city sky? People start to forget how it used to look, how it used to be, how it used to sound: suddenly, when we lose the older generations, there are no people alive that remember that we used to hear birds singing even in the centre of the city. How can biodiversity loss feel like a loss if you don’t know what you’re missing?

But after all this talk about connection and emotions, we still need scientific, ecological research. So, we can argue that nature connection is important because it might precede pro-environmental behaviour. We have also here stated that fostering it comes more through experience and emotions than education. However, this cannot be highlighted enough: we need science, we need reliable knowledge, we need evidence-based information and advice. If the baseline is shifting in our collective reality, we need science to tell us where it is. This is true both for global conservation (we

need to know what needs to be done) and also on the small scale for the wildlife gardener. The core of wildlife gardening is to benefit species and protect habitats and none of it, no matter how well it would connect the gardener to their surroundings, is actually in the core of it if it isn't backed by research. This came up in the analysis and especially in the interviews: to be able to convince and motivate people to do these actions, they need to be based on research. People need to know that they are doing the real thing that has an actual impact. In addition, advice that is based on a hunch and old assumptions, can in practice be very counter-productive to the urban conservation goals.

5.5 To cultivate is to care

But if we protect best the things we value: what about care, then? The research in environmental humanities is increasingly focusing on initiatives that concentrate on how human lives are entangled with the lives of others. We wouldn't be here without our multispecies companions, from plants producing our oxygen and food to bacteria dwelling in (and forming big parts of) our bodies. Benson et al. (2017) write that immersion in the worlds of other species can hopefully result in more relational ethics towards more-than-human species and in new ways of living in this “fundamentally shared world”. I argue, that in the best case, wildlife gardening could provide this, maybe an entry-level, immersion to the non-human lifeways and foster care towards others. Isn't that what dedicating your time to cultivating something and focusing on creating means of survival for others is? In this research, also the interviewees highlighted that the more people are getting engaged, the more they care – and the more willing they are to protect.

Does care across species differ from care from the care we have for our own? Care can be defined “*as a species activity that includes everything that we do to maintain, continue, and repair our ‘world’ so that we can live in it as well as possible. That world includes our bodies, ourselves, and our environment, all of which we seek to interweave in a complex, life-sustaining web.*” (Tronto, 1993). This definition of care resonates, as it talks about care in an active way: maintaining and repairing, both for us and others. This definition of care also fits the context of environmental crisis. We are aiming to foster, protect and maintain what we have and aim to repair what has already been lost. All of that happens in the web of life, that we are inherently part of. This care happens on the small scale of a garden as well, maintain what we have and repair what needs your attention.

Despite the encouragement to care, in the wildlife gardening guidance, as stated in the results section, the role of humans in nature's network is not emphasized. The human stays as an observer of their garden, admiring and nurturing yes, but somehow separate, or above it. This human-nature dualism however is exactly what the research in environmental humanities is trying to dissolve. Thus, this is

where the wildlife gardening guidance is potentially missing its chance to intervene and have a greater impact: breaking the boundaries between species and breaking the dualism that is so strong, especially in the thinking in the global north. The call to care is underlying in the guidance but it doesn't necessarily break free from these assumptions of our place in the web of life.

5.6 But where is the radical root

When we look at the findings, how the need to act is argued for in the guidance, it circles mostly around the reward for the gardeners themselves and highlights the easiness and potential for impact. The loss, the crisis was conspicuous by its absence. Isn't it a bit of a problem that the urgency, loss, crisis isn't present? Isn't that the whole point of all this? Is it enough if we have happy gardeners doing their tiny bit and enjoying it, or should the aim be to radicalise gardeners to take action further - and also further from their plot?

As emphasized earlier when highlighting the need for comprehensive approaches, some research does argue that one of the reasons behind all sustainability challenges is our and our societies' inability to look at these crises as complex issues. The very act of disconnection and reductionism, separating causes and effects from one another, is something that is causing these environmental crises in the first place. Studying gardens is fully in between disciplines and therefore almost automatically combines methods of ecology, biology and conservation science, but also touches environmental psychology and for sure also in practice urban policy making. As we are talking about actions of private actors, individuals, where does the responsibility lie to do and to encourage them to do, these actions and who's responsibility would it be to take it one step further, to *radicalise* the gardener? We could argue, that in the face of existential crises like biodiversity loss and climate change, the role of scientists and researchers as "neutral" observers would fall apart. Traditionally, science and policymaking are separate from each other, as described by Oppenheimer et al. (2019): "*In theory, the relationship between these domains is clear: scientists, acting as independent professional experts, self-assess their knowledge base and make this information available to those who may wish to use it (or not) to inform policy choices*". However, they argue that this is changing for example in climate assessments, where scientists are not only asked to produce facts but for example also assess how *dangerous* some scenarios are. Naomi Oreskes in her article titled "What is the social responsibility of Climate Scientists?" (2020), asks do scientists have a responsibility to "*ensure that our findings are known, understood, and put to use to protect our fellow citizens, even if it means expanding our activities beyond the field and the laboratory?*" This is a multifaceted question, and there is no clear answer to the role of scientific knowledge production in times of crisis. But then again, isn't disconnecting

science and policy completely from each other, especially in life-threatening matters, exactly that type of *differentiative thinking* that we argued potentially being at the core of causing these challenges?

Then again, for example in the case of the wildlife gardening guidance and the call for radical approaches, it is these environmental organisations that are transforming the scientific knowledge into a digestible form for the residents to use. That transformation could easily also be the spot where scientific information could take a form to encourage and push people to take the issue seriously, and to be more radical. For some reason, however, these organisations are not doing this that much – but leaning toward more conventional ways of convincing people of the need for this. We could, however, argue that there is no time for this “small steps are enough” attitude: we are in the midst of a crisis.

What emerges from the whole analysis: gardening, it seems like, it is not radical, it is quite personal. It focuses on the tiny things, which kind of makes sense, tiny things on the tiny plot of land. **Maybe it is a waste not to invite this group of people to the radical fight against environmental degradation, maybe it is a waste not to link all of this more to the crisis, loss, or urgency - we are nevertheless living in a time of extinctions, in the capitalist ruins, and precarious times.** However, maybe it can be considered radical - that the people are invited to care, nurture and love - to admire, to look at their lot with love. And to understand that the things that they do can have an impact, our role in conservation, no matter how small, and it is not meaningless to notice that other people are also doing things, also acting upon all this. So, does wildlife gardening solve the biodiversity crisis? Of course not. Is it still meaningful, right and good? Yes.

Maybe, the biggest finding is that maybe, gardening in your urban garden is not radical. With the guidance for gardening for wildlife, we cannot motivate the individuals, the little gardeners, to rise against the whole system that brought us into this mess that we are in, the cascading environmental crises looming everywhere we look. It seems like it is difficult to motivate individuals to act by putting the crisis, urgency, loss and threat to the front. But what seems possible, is to advise people to act in practice, so that they know what they have to do in order to make a difference, at least locally for the species around them, or possibly even in terms of the whole biodiversity crisis. And what seems based on this research the most central, is the possibility to encourage people to *care* for the species around them, to take care, to stop and admire. If this stops the extinction of experience and the loss of experiences of wildlife for urban dwellers, it might be the biggest impact of wildlife gardening that there will be. The understood connections, the *art of noticing* (Tsing, 2015) that they can take with them from the garden to the paved everyday life on the streets and offices, that will make them practice care across species boundaries, *multispecies care*, an actual connection to the rest of nature, has an impact that can be a lot bigger than the size of the garden lot. To be radical is to have roots: a call to garden for wildlife is a call to care, and in the end, that care is the radical bit.

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Annex A: List of analysed wildlife gardening guidance documents

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