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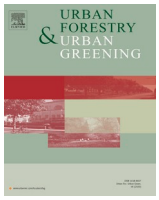

Review

Finding justice in wild, novel ecosystems: A review through a multispecies lens

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ABSTRACT

Though most cities, particularly in the Global North, have been intensely modified by human activities certain locations still exist in varied forms of abandonment or disinvestment, often allowing for new species assemblages to flourish. These urban novel ecosystems or informal wild spaces are often perceived as in-between or overlooked, calling into question their value and social-ecological role, while also creating tensions amongst different groups and stakeholders who share different visions for their use and management. Within these tensions, issues of justice and equity can be more pronounced and surface historic legacies of environmental contamination, inequitable development, and extraction. Despite this, very little is known about the social-ecological role informal wild spaces play in urban areas, and how best to interrogate and understand the equity and justice dimensions they elicit. To fill this gap in knowledge, this paper critically examines the literature on urban novel ecosystems in relation to justice, with a particular interest in multispecies justice. Through this analysis, gaps in the literature are exposed, while also arguing the informality, neglect and contestation of wild urban spaces provides opportunities to explore issues of access, benefits and harms, particularly in light of global climate and ecological crises. A systematic approach is utilized to search the literature, identifying 45 papers which are thematically analyzed under a justice lens. The study identifies three themes that thread throughout the literature: distributional injustices relate to perceptions and attitudes, which give rise or arise from injustices; the regeneration discourse focuses on a 'new nature', which is based on social-ecological displacement and devaluation; and the potential of urban wild spaces to generate new multispecies sensibilities. The paper concludes by discussing trends, gaps, and emerging discourses, and proposing a multispecies justice approach for urban planning through the learnings and engagement with urban wild, novel ecosystems.

1. Introduction

By 2050 the vast majority of humans will reside in urban areas, and of these a high proportion of citizens are unlikely to have access to wild reserves far from the city (UN Habitat, 2022). The predicted high level of poverty and inequality in urban areas worldwide may mean that many people growing up in cities may only be able to experience 'wild' landscapes in unused or unmanaged spaces in their city. However, evidence continues to emerge on the values and necessity of contact with nature as being essential for well-being and healthy growth (Arola et al., 2023; Barragan-Jason et al., 2023; Sheffield et al., 2022;). The twin crises of climate and biodiversity continually focus attention on the shifting ecologies and the emergence of novel ecosystems, that is those anthropogenic ecosystems that have no historical analogue and are

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Box 1
Exploring various wild and novel ecosystem understandings regarding the range of disciplinary interpretations and diversity of thought.

ECOLOGY

Novel Ecosystem
'A system of abiotic, biotic and social components (and their interactions) that, by virtue of human influence, differ from those that prevailed historically, having a tendency to self-organize and manifest novel qualities without intensive human management. Novel ecosystems are distinguished from hybrid ecosystems by practical limitation (a combination of ecological, environmental and social thresholds) on the recovery of historical qualities.' (Hobbs et al., 2013: 58)

Non-Analog Communities
'No-analog communities consist of species that are extant today, but in combinations not found at present. "No-analog" is there-fore shorthand for "no present analog" and can refer to both past and potential future communities. This definition casts no-analog communities as ecological, not evolutionary, phenomena, because it is assumed that the constituent species still exist today but are reshuffled into combinations not found at present.' (Williams and Jackson, 2007:477)

Ruderal Ecologies or Landscapes
'... expressions of spontaneous ecological self-organization in cities, as well as novel forms of adaptation and ecological traits related in part to what researchers describe as "rapid urban evolution," or the accelerated adaptation of plants and animals to urban environments" (Kennedy 2022: 7). "Neither wild nor domesticated, ruderal communities depend on what is known as an "edge effect" and the juxtaposition of contrasting environments in one ecosystem." (Stoetzer 2018: 297).

Novel Urban Ecosystem
'Ecosystems that persist or arise in cities, resulting from -and structured by- intentional or indirect human management actions (including inaction/abandonment); with unique species composition and structure influenced by biotic introduction and invasions; and that provide a suite of ecosystems services/disservices resulting from interactions of the biota with the altered abiotic urban environment.' (Ahern, 2016:13)

Emerging Ecosystem
'An ecosystem whose species composition and relative abundance have not previously occurred within a given biome'. ... 'Ecosystems that develop after changing social, economic and cultural conditions so change the environment that new biotic assemblages colonize and persist for decades with positive or negative social, economic and biodiversity consequences.' (Milton, 2003: 404)

Wild Spaces
'we define wild spaces quite broadly to encompass any space or component of an urban ecosystem (e.g. a patch within a park) where there is an absence of ongoing human intervention, where organisms are able to respond to their base instincts (e.g. through sexual reproduction) or self-assemble' (Threlfall and Kendal, 2018)

GEOGRAPHY / ANTHROPOLOGY

Urban Wilderness
'Urban wilderness areas can thus be defined, from an ecological perspective, as places characterized by a high level of self-regulation in ecosystem processes, including population dynamics of native and nonnative species with open-ended community assembly, where direct human impacts are negligible.' (Kowarik, 2018)

Informal Urban Green Spaces (IGS)
'IGS as an explicitly socio-ecological entity, rather than a solely biological or cultural object [...] with a history of strong anthropogenic disturbance that is covered at least partly with non-remnant, spontaneous vegetation [which is] neither formally recognized [or its vegetation managed] by governing institutions or property owners as greenspace [...] or for environmental protection [...]. Any use for recreation is typically informal and transitional [...].' (Rupprecht and Byrne, 2014: 598)

Urban Wildscape
'Evolved, rather than designed or planned, these derelict, abandoned and marginal spaces are frequently overgrown with vegetation and host to a wide range of human activities. They include former industrial sites, landfill, allotments, cemeteries, woods, infrastructural corridors, vacant lots and a whole array of urban wastelands at a variety of different scales.' (Jorgensen and Keenan, 2011:ii) '... complexes of spontaneous 'ruderal' (hardy or weedy pioneer) vegetation that colonize disturbed urban sites...' (Gobster, 2012:33)

Urban Wastelands
'[U]rban habitats which are potentially of great importance for biodiversity. These sites often accommodate a rich flora and fauna including rare species.' (Bonthoux et al., 2014: 80). 'They are perceived as non-functional, which is the reason why they usually appear in the context of revitalization or any other future use. Actual use consists mainly of unofficial, bottom-up, sometimes illegal practices like, for example, homeless people's dwellings, scrap collecting, urban exploration or occasional recreation.' (Gańko, 2020:149)

Intersticial Spaces
'[C]an take the form of abandoned industrial zones, areas of countryside, agricultural plots, landfills, brownfield sites, security buffers, abandoned buildings, closed military facilities, derelict public spaces and underused land, geographically restricted spaces, [...] [which while] fundamentally different, [...] [they] increase the spatial complexity of suburban areas and therefore demand new political, economic and socio-environmental investigations into what these spaces are, and what they could be' (Silva, 2017:55-56)

Wastescape
'[W]astescapes can be considered as experimental areas that help with 'enabling contexts', [...] where developing innovation is combined with the engagement of all stakeholders [which can] be involved in this process of regeneration [...] [that] embraces the landscape's opportunities and territorial conditions' These are also places with lost identities, unsuitable for human productive purposes, polluted and sometimes with low or high biodiversity (Amenta and van Timmeren, 2018).

SOCIAL SCIENCES

Unintentional Landscapes
'[Connected to] a myriad of zones of neglect that have proliferated alongside human activities at a global scale... [it] is not a primal landscape in the sense of 'wild nature' [or] an idealised landscape that conforms to some pre-existing conception of the innate relations between nature and culture, and it is not a designed landscape allied to particular social or political goals. It is a landscape in spite of itself; a focus of intrigue or pleasure that has emerged irrespective of its anomalous or redundant characteristics' (Gandy, 2016:433-434)

Superfluos Landscapes
'These landscapes occur when no meaningful or productive use is made of a concrete area, space, or surface. In that way the idea of them as heterogeneous derives not only from a structural perception of them but also from their temporary character and continuous transformations. The superfluous landscape is not a stable entity; rather, it must be considered as part of an ongoing transformation process on a material level.' (Nielsen, 2016:56)

Terrain Vague
'Empty, abandoned space in which a series of occurrences have taken place...' 'Unincorporated margins, interior islands void of activity, oversights, these areas are simply un-inhabited, un-safe, unproductive. In short, they are foreign to the urban system, mentally exterior in the physical interior of the city, its negative image, as much a critique as a possible alternative.' (de Solà-Morales Rubió, 1993:199-120)

Ambivalent Landscapes
'[Relates to] ambivalent feelings we experience in relation to urban woodland and other wilder urban landscapes such as derelict sites that have been re-colonized with vegetation as a result of natural succession [...] (Jorgensen and Tylecote, 2007: 445). 'The double association between wilderness and thoughts about death and freedom supports the idea that wilderness activates ambivalent meanings.' (Koole & Van den Berg, 2005:1017)

unlikely to be restored to anything like their historical precedents (Hobbs et al., 2009; Collier, 2015). Ongoing urbanization and land-use change, therefore, creates opportunities for a 'new nature' or 'future-scapes' (Choi, 2004) in our cities, and this calls for attention to be paid to the perceptions and values of this new nature by citizens.

Though often contested (Murcia et al., 2014), the concept of a novel ecosystem is often misconstrued as a relatively new idea, yet Mascaro et al. (2013) suggests the foundation of the concept may date back to the early 20th century. The work of Gleason (1926) identifies the difficulties of classifying particular ecosystems through conventional ecological sciences approaches given the individualism of plant association. This insight provides the foundation for the novel ecosystem concept as the classification of ecosystems growing independently depending on their environments. This means the plant communities are continuously in various stages of succession, the first of three foundational principles of novel ecosystems. The second principle is rooted in various ecological research carried out through the 20th century (Jenny, 1994; Odum, 1969; Tansley, 1935) which understands these changes are occurring, and the biotic and abiotic characteristics of the ecosystems are tethered. As Mascaro et al. (2013) states 'they interact, following from one another and feeding back to one another'. The third principle relates to the anthropogenic nature of novel ecosystems, with humans creating lasting impacts on ecosystems which Chapin and Starfield (1997) coined as novel ecosystems when characterizing the outcomes of species composition and disturbance regimes from human-induced climate change and other activities.

Similar to the characteristics discussed above, Hobbs et al. (2006) identify two key characteristics of novel ecosystems: (1) novelty, referring to novel species combinations and their role in altering ecosystem functioning; and (2) human agency, resulting from anthropogenic interventions but not necessarily relying on human maintenance. Consequently, research has been conducted to understand the function of these spaces, leading to the development of terms such as 'emerging ecosystems' (Milton, 2003) and 'non-analogue communities' (Williams and Jackson, 2007). When discussing these ecosystems, the literature generally provides examples in the form of tropical forests, agricultural landscapes, and colonized grasslands (Mascaro et al., 2013, Hobbs et al., 2006). However, the understanding of novel ecosystems has ultimately evolved from an ecological focus to the wider study of geography, particularly within urban studies. Along with this evolution, our depth of understanding regarding the values placed upon the spaces, the associated feelings, and the role of novel ecosystems within modern society has also progressed.

The emergence of novel ecosystems within the geographical literature may be due to their identification as social-ecological entities, referred to as informal urban green spaces (Rupprecht and Byrne, 2014). This is because our understanding of novel ecosystems is increasingly informed through our notions of human-nature relationships and wilderness, which identifies a host of ambiguities associated with these spaces. More recently, within urban literature, novel ecosystems are being identified as 'wild spaces' (Threlfall and Kendal, 2018) and 'urban wilderness' (Kowarik, 2018), incorporating the original ecological perspective into a typically anthropogenic research of urban studies. The associated terminology, including 'ambivalent' (Jorgensen and Tylecote, 2007), 'superfluous' (Nielsen, 2002), or 'unintentional' (Gandy, 2016), provides new ways of understanding novel ecosystems (see Box 1 for a catalog of similar concepts). Furthermore, the opacities of novel ecosystems can provide assistance when approaching several disciplinary perspectives and engaging with differing vernaculars. For example, Lidström et al. (2016) explores the representation of plurality within environmental narratives which, when recognized, can reveal injustices within the discourse and the language use to demonize novel ecologies.

Novel ecologies are now understood as multiscalar, ranging from tiny micro-wild spaces in the corners of buildings, or larger areas, that are the remnants of abandoned urban and peri-urban farmland or post-industrial activities, more commonly known as brownfields or wastelands. Generally speaking, these wild, self-organizing and self-sustaining ecosystems tend to arise from neglect, abandonment or as the byproduct of urbanization. Gandy (2016) refers to these spaces as unintentional landscapes; spaces hard to define or categorize that are waiting for human-nature encounters to create them and '.include an array of spontaneous spaces of nature that hold cultural or scientific interest as part of an explicitly counter-utilitarian discourse even if such spaces can be designated a putative role in terms of 'ecological services' or as a vernacular form of public space' (p. 434). One aspect that tends to characterize them is their emergence from human activities, traces of past activities, of capitalism, and their condition of impermanence as they await 'development'.

Urban novel ecosystems thus present fascinating habitats to explore counter narratives and framings that exacerbate injustices or engender social-ecological practices of mutual repair and restoration. Justice, which is complex and presents difficulties to operationalise, nonetheless offers a multidimensional concept to investigate how power, disadvantage, neoliberal and counterhegemonic narratives and understandings create novel ecosystems, but also shape them into new spaces. At its core, justice is associated with what is right and wrong, good and bad, and it cuts across individual, social, and political circles, highlighting wrongs being done and finding ways to undo or repair them (Campbell, 1988). In the context of urban environments, justice is not only a critical analytical lens, but also a means to explore complex phenomena that are shaped by interconnected and entangled social, ecological, and technological materialities and forces. Drawing from many philosophical and political theoretical understandings, a theory of *the just city* was first laid out by Susan Fainstein (2000; 2014) with democracy, diversity, and equity as the principles for achieving justice. Scholarly work emerging around notions of social justice in cities highlighted the inequitable processes and outcomes of planning policies and strategies. This work has seen in parallel the emergence of grassroots movements seeking recognition and reparations from environmental harms and impacts, originating with the environmental movement in the USA and leading the way for a worldwide movement and theory of environmental justice (Schlosberg, 2007). Many of these struggles manifest(ed) through distributional inequalities, in which marginalized or disadvantaged communities living near or within industrial land uses and/or polluting activities, are burdened by the effects of environmental impacts (Schlosberg, 2007; Bullard, 2002). Environmental justice thus, has elevated the discussion of justice as a matter of distributional inequalities, to one that includes other critical justice dimensions - recognition and participation. This acknowledgement emphasizes that justice is also linked to recognizing different cultures and socio-cultural ways of being and enacting participatory decision-making systems and processes that encourage inclusivity, community knowledge, diversity and cross-cultural understandings that give a voice to excluded and marginalized communities (Schlosberg, 2007).

The climate and biodiversity crisis have also brought increasing attention to how climate change impacts and biodiversity loss affect not

Table 1
Search strategy including the four areas of coding and similar terms.

Main areas	Search terms
spatial / land use / physical space	"novel ecosystems" OR "anthropogenic ecosystems" OR "emerging ecosystems" OR "informal green spaces" OR "wild space" OR "land abandonment" OR "vacant land" OR "anthropogenic landscape" OR brownfield OR wasteland OR "post-industrial" AND
justice dimensions	justice OR power OR participat* OR recogni* OR distribut* OR capabilit* OR precedur* OR equ* OR fair* OR conflict OR contestation OR access* OR multispecies OR "ecological justice" AND
nature / vegetation	"wild nature" OR wild* OR "spontaneous vegetation" OR biodivers* OR nature OR vegetation OR species AND
urban	urban OR cit*

only the most vulnerable human populations, but also how more-than-human lives experience destruction, damage, and loss, and how this reflects as a matter of justice. These broader justice frameworks seek to include the voice of the more-than-human, both individually, but also more broadly as communities and systems. Calls for ecological justice, or justice for nature, have been framed from different perspectives, including rights to nature, entitlements of the nonhuman, moral relationships to the nonhuman world, and the consideration of needs and interests of all life forms (Low and Gleeson, 1998; Nussbaum, 2006; Schlosberg, 2007). This latter point brings the notion of capabilities as a fourth dimension of justice and focuses on the abilities, needs and opportunities needed for humans and nonhumans to flourish in a state of well-being and integrity (Nussbaum, 2006; Schlosberg, 2007). This wider recognition of all life forms, but in particular the 'other', as the ones that are devalued and misrecognized, to be part of the community of justice is a repositioning of justice as 'quintessentially relational' which is a matter of obligations and duties and of resisting human exceptionalism (Tschakert et al., 2021: 4).

More recently the notion of "multispecies justice", first introduced by Donna Haraway (2008), has emerged as a central concept within the nascent field of multispecies studies, an interdisciplinary field that aims to highlight the multiple ways of understanding how human communities are entangled and entwined with the lifeways of other organisms. The field draws from a range of Indigenous and traditional cosmologies and practices that reject any separations or binaries between humans and other species (Caston 2013), and has a number of historical roots in the 20th Century which Celermajer et al. (2021) explore, ranging from animal rights and environmental justice, to political ecology and post-humanism. Central to more recent conceptualizations is the idea that modern ontologies and practices of urban planning, governance, policy, and design (particularly in the Global North) privilege human needs over other species (Betz and Coley, 2021). Scholars increasingly explain this flawed perspective results in not only a biased view of urban nature but also may not be sufficient to ensure our survival and mutual flourishing, arguing instead for an alternative framing called "multispecies sustainability" (Rupprecht et al., 2020; Houston et al., 2018). This

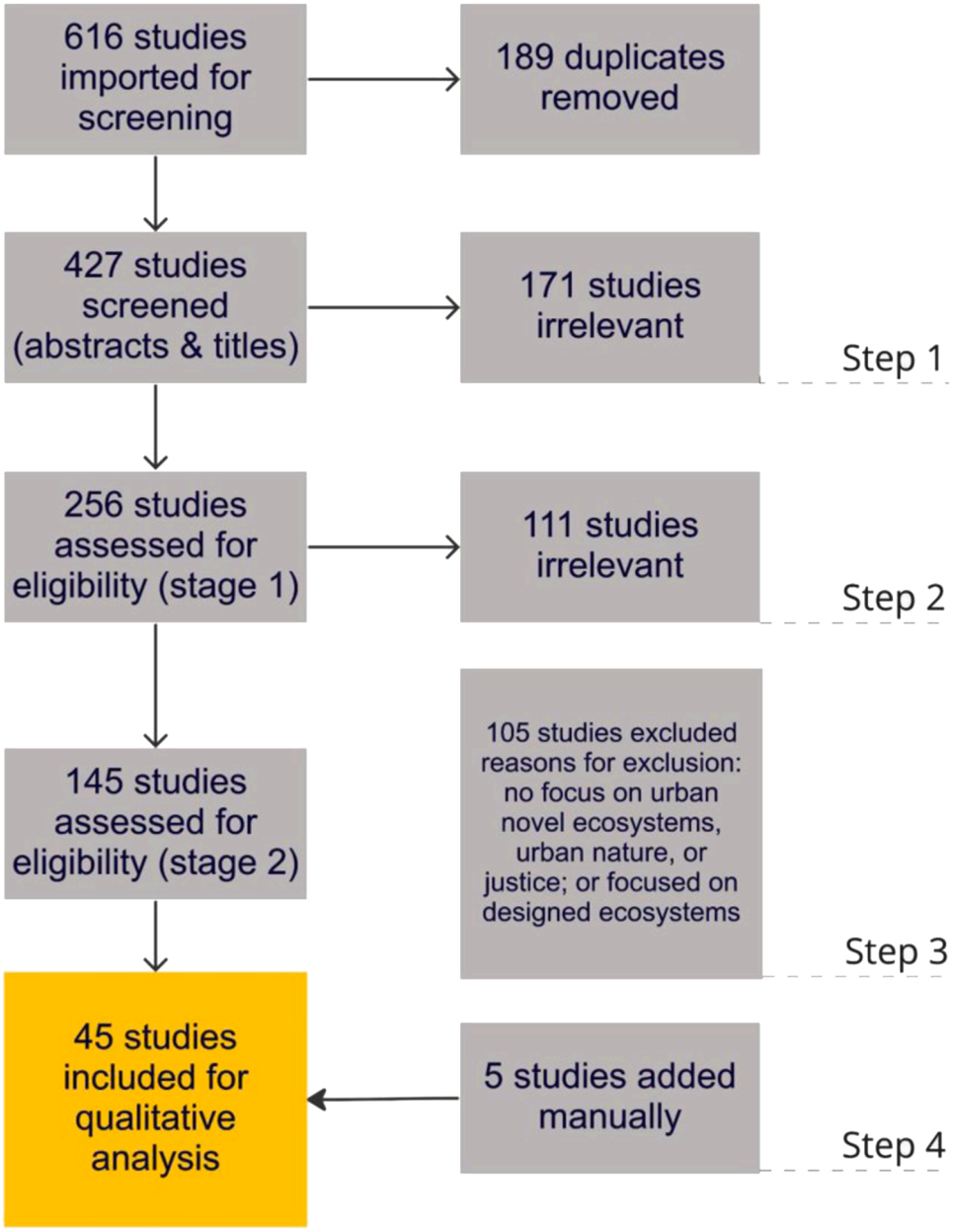

Fig. 1. Screening process with steps for including and excluding academic journal articles.

framing argues for acknowledgement of human and more-than-human needs as interdependent and intertwined, through which contemporary practices should be reframed to confront the shortcomings of human-focused management systems.

In parallel, many Indigenous scholars and theorists increasingly argue multispecies justice can be useful in deconstructing and highlighting divergent power dynamics created through human-focused systems that fail to recognize the agency and needs of more-than-human actors. Multispecies justice thus advocates for the utilization of relational ontologies between humans and other species and highlights intersecting concerns for how we frame, recognize, and understand the subject of justice. This is not merely a consideration of the "rights" of other species, but rather an expanded idea of ethical arrangements between human and more-than-human species and calls to rethink current and historic practices, policies, and traditions that privilege humans. Multispecies justice thus demands an intersectional framing of justice, for whom, why and to what ends.

Cutting across several areas of inquiry, this paper seeks to explore the connections between urban novel ecosystems and justice. With this review, we progress our understanding of how urban wild spaces are entangled in power dynamics, which are at times driven by socio-economic pressures. We explore how these wild spaces are the products of past, present, and future injustices, which manifest through issues linked to historical legacies of urban change, neglect and abandonment, and land speculation. By unpacking the spatial, temporal and socio-economic governance dimensions we hope to better understand how people relate and care for urban wild spaces and the types of connections and actions that lead to just or unjust outcomes. With this in mind, our main research question asks how is justice explored in research on urban novel ecosystems globally? And for whom and what does it include in the framing and scope of the research? Given the focus on wild spaces and issues of justice in the context of cities, we also extracted from the literature recommendations for the use and governance of these spaces and the implications for planning sustainable and just cities.

In the following sections we present the process for carrying out this systematic review and the qualitative analytical approach. We then summarize the results in which we identified three main themes which reflect different justice issues, such as accessibility, supply and demand of ecosystem services in relation to different social groups and their perceptions, as well as deeper issues of erasure and displacement – sometimes framed under narratives of regeneration and development, and finally, the capacity of these spaces as futurescapes to provide refuge for novel life forms, new ways of understanding urban nature, and the creation of human-nonhuman entanglements. We discuss this review's implications, gaps and discourses identified. From this we present a set of planning and design recommendations that bridge two concepts: novel ecosystems and multispecies justice. This we argue provides a more equitable and multidimensional understanding and model for assessing our relationship to novel ecosystems and wild spaces in cities and how we plan and design from a more-than-human lens. A brief conclusion points to areas for future research to be developed.

2. Materials and methods

To gain a better understanding of how novel ecosystems in cities are studied in relation to issues of justice, we reviewed the literature through a qualitative systematic review protocol based on the PRISMA guidelines (Moher et al., 2009). This method provides a methodical approach "to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review" based on a clearly defined question (Moher et al., 2009). In our case, our main research question investigated how justice is explored in novel ecosystems research, particularly in the context of urban settings.

2.1. Search strategy and study selection

Within a wider understanding of wild spaces in cities, we focused on the intersection of three main areas: novel ecosystems or informal wild spaces, the wild nature or spontaneous vegetation and species they contain, and justice, all within the urban context. We conducted several iterative searches with similar terms across these focus areas and developed a search strategy (see Table 1) to search for academic literature in Scopus and Web of Science databases. It is important to note, as shown in the introduction and Box 1, terms such as novel ecosystems, wild spaces and informal green spaces tend to be used within and across different disciplines, and as such we use them interchangeably. The iterative searches assisted in refining and clarifying the terms in relation to the main research question. Given the recent scholarship of novel ecosystems, we kept an open time frame, which yielded records from 2006 to present.

As recommended by the PRISMA guidelines (Moher et al., 2009), we conducted and documented the different stages for searching, screening, and excluding/including records (Fig. 1). Our search brought up 427 (after removing duplicates). After screening the titles and abstracts (screen 1), we included 256. A second screen was done by 'skimming' through the texts to ensure the papers were relevant, as for many of them it was unclear by just reading the abstract and titles. This yielded 145 papers. Screening 3 included a full-text review of the papers, for an inclusion of 45 papers. In addition, we added additional papers that did not appear in the search (step 4, Fig. 1). This was done by identifying important papers that were highlighted through the full-text review, through a search in Google Scholar, and through authors including specific papers they considered relevant, but were missed in the search. For these records we used the same search and screening criteria. Forty-five papers were included in the qualitative analysis.

To account for bias in study selection, we used an iterative screening and appraisal approach in which at least two co-authors reviewed each record. We conducted three screening stages which helped us refine and select the papers that were relevant for answering the research question. Broadly, articles that were excluded did not focus on the species or biodiversity in novel ecosystems, did not focus on justice, were not set in an urban context, and were about designed ecosystems on novel ecosystems.

2.2. Data extraction and analytical strategy

We used a thematic analysis approach to explore the themes, similarities, and divergences across the literature. A qualitative reading of the literature offers a synthesis of assessed literature, the current and past trends, identifies knowledge and practice gaps and offers suggestions for future research and practice (Braun and Clarke, 2006). A qualitative systematic review allows for replicability of the search strategy, but not of the analysis.

A qualitative analytical approach is more appropriate to studying the complex and multifaceted nature of justice and the myriad of ways in which it manifests and in which it is studied. Thus, in this review we approach the texts open-endedly, allowing the themes to emerge and finding patterns or similar ways of knowing the subject. However, we also focused on some specific questions or elements we wanted to extract from the literature, such as to the types or dimensions of justice the literature was referring to (e.g. distribution, participation, recognition, capabilities), if the focus was from a social, environmental of multispecies justice lens, the types of methods used, disciplinary framings. Additionally, we searched the literature for practical planning and policy recommendations that could help us bring forward a discussion of reparative practices within a justice framework. For more details of the thematic extraction see Electronic Supplementary Material.

It is important to note that as with any other methods and methodologies of choice, this one comes with limitations. For instance, we acknowledge that we are missing a large body of work from the grey

literature and other forms of documenting justice struggles, such as news articles, blogs, and other media outlets, which can provide a different lens that better highlights injustices in these spaces, shifting the findings and implications. Our review also showcases literature that reflects a global distribution of articles with a clear Global North bias. This, however, can be levelled with future research and a more nuanced understanding of how these spaces are understood and qualified in other regions of the globe. Also, the search terms selected do not necessarily capture some papers that use different terms, however, for practical purposes it is important to bound the search strategy to the most used and similar terms.

3. Results

Firstly, it is worth noting that although filled with many gaps, new research interest in novel ecosystems and justice is emerging in urban studies. Three main themes emerged from this literature review: 1) the relationship between distribution, perceptions and attitudes give rise and arise from injustices, 2) regeneration through new, replaceable nature narratives creates displacement and devaluation, and finally,3) the potential of these spaces as refuges for novel life forms, new ways of understanding urban nature, and the creation of human and more-than-human entanglements.

3.1. Distribution, access and perceptions of urban nature give rise or arise from injustices

This review identified several major themes which cut across issues of distributive justice and the perception or attitudes towards green space availability and access, and uneven distribution, in relation to different factors. The potential of informal green spaces to fill a deficit of green space per capita (Tomao et al., 2017) was an important measure for addressing distributional injustices related to green space access. For example, through a social-ecological analysis of vacant land in New York City, McPhearson et al. (2013) demonstrated the potential of these sites, which tended to provide ecosystem services to communities with social needs, such as stormwater mitigation, air pollution removal, and habitat for biodiversity.

Another theme that emerged is the nexus between land vacancy (Lokman, 2017), the distribution of overgrown or spontaneous vegetation (Pearsall and Christman, 2012) and proximity to marginalized or disadvantaged communities (Berland et al. 2020). For example, Lewis et al. (2017) found that following the catastrophic events of hurricane Katrina, patterns of post-disaster land abandonment and forms of ruderal vegetation were more prevalent in communities of color and socio-economic disadvantage. Similarly, a study by Pearsall (2017) suggests vacant lots were located in areas characterized by social disadvantage and extreme temperatures. These studies suggest that the distribution of wild spaces in cities follows a social gradient that mirrors inequity in access to formal greenspace (Nesbitt et al., 2019; Rigolon, 2016). This has led (Kowarik, 2019) to begin to explore how the appearance of novel ecosystems could be adapted to reduce negative perceptions of wild spaces and reduce inequalities in access to greenspace.

Several of the reviewed studies focused on the perceptions and attitudes in relation to the proximity, access, and characteristics of urban novel ecosystems. The first aspect is that novel ecosystems, in particular brownfields, wastelands, and vacant or abandoned lands, are associated, or tend to be near neglected and disadvantaged neighborhoods. Several take a departing point of view that these novel ecologies are spaces of blight and their closeness to poorer/disadvantaged groups and their effects of associations with each other is a matter of justice. For instance, Berland et al. (2020) show that vegetation abundance does not equate to 'just' social-ecological outcomes when looking at the shrinking city of Toledo, Ohio, because most vegetation is spontaneous and occurring in areas of disinvestment. In this sense, novel ecologies are seen as a disamenity. Similarly, brownfields, wastelands and vacant lands are associated with toxicity, contamination, pollution, and trash, and studied in terms of how they tend to be closer to the most socio-economically disadvantaged communities. Studies on brownfield perceptions showed that participants link industrial remnant landscapes with contamination and health concerns, especially if they are susceptible to health issues (Kim and Miller, 2017) and perceive abandoned landscapes with more pollution concerns (Kim and Kang, 2019), as lacking maintenance, inaccessible, full of weeds and rubbish, and unsafe in the case of recolonized creeks (Kelly et al., 2022a), and relate naturalized areas with wildflowers with abandonment and trash (Meenar et al., 2022).

Thus, people's perceptions can influence the acceptance of novel ecosystems as urban ecosystems with the capacity to provide benefits and services to the local communities, it is critical to understand preferences and attitudes (Hofmann et al., 2012; Kim et al., 2020; Pietrzyk-Kaszyńska et al., 2017; Rupprecht et al., 2017a). There were studies focused on understanding people's perceptions on urban novel ecosystems or informal green spaces to better inform decision-making in light of viewing these spaces not as blight, but rather with potential to provide benefits for underserved communities. For example, by reducing inequalities for specific populations where there is an unequal distribution of green space in cities, such as for children and seniors, informal green spaces can provide different ecosystem services (Sikorska et al., 2020). Highlighted was the importance of accessibility to green space, particularly for the elderly, women, disadvantaged groups, and the potential of these spaces in providing ecosystem services and well-being outcomes (Kim et al., 2018; Wlodarczyk-Marciniak et al., 2020). These studies show on one hand the lack of recognition from governance actors in terms of the social-ecological value of these spaces, but then also how this devaluement becomes part of a larger societal attitude or policy formations that gives rise to these spaces being invisibilized and easily erased when new narratives of development emerge (Kim et al., 2020; Pietrzyk-Kaszyńska et al., 2017; Rupprecht 2017a). The only study within this theme that considered a more-than-human or multispecies approach, argued for the potential of informal green space to be territories of encounters, where people are more willing to co-exist with species that they would otherwise perceive as unwanted or not belonging to a shared urban space (Rupprecht 2017b).

3.2. Regeneration through a replaceable nature narrative: displacement and gentrification of people and nature

A recurring narrative, particularly surrounding the use of brownfields or post-industrial sites often referred to as "wastelands", explores the need for regeneration by replacing novel ecosystems with "native" plantings to create a "new or replaceable" nature. This narrative is underscored by an assumption that novel ecosystems are voids that need to be "regenerated" and replaced to remove so-called blight and neglect. This can result in social-ecological injustices such as gentrification and displacement of existing social and ecological communities.

Triguero-Mas et al. (2022) for instance discuss how "green gentrification" and practices described as "re-naturing" or "re-wilding" are increasingly taking place, especially in global North cities. They provide an analysis of 28 urban case studies in North America and Europe and describe an increased trend toward "green branding" among developers that rarely consider alternative typologies of green spaces (e.g. gardens, recreational spaces, greenways, and informal green spaces). Large parts of the literature also describe practices to 'clean' or 'regenerate' brownfields and wastelands by altering the land use of these spaces, those focused on bioremediation and removal of invasive species (Moyles and Craul, 2016), as well as habitat reconstruction to transform 'low-quality' habitats, to higher quality environments (Filibeck et al., 2016). As city planners increasingly point to "restored" sites as successful examples of so-called urban renewal (see Moyles and Craul, 2016), they often ignore the unintended consequences of gentrification and displacement and discount the ecosystem services provided by novel

ecosystems prior to redevelopment.

Draus et al. (2020), in their study of cities like Detroit (USA), question the practice of "remaking weedy wastelands" into ornate or well-manicured parks such as the High Line in NYC, which can often result in a reduction of ecosystem services and requires carbon-intensive inputs such as fertilizers and herbicide. What emerges from this narrative is a cultural acceptance if novel ecosystems are transformed into greenspaces based on ideas of monocultural landscape planning (Draus et al. 2020). To counter this, they propose instead for city officials to consider "just greening" strategies such as the establishment of informal green space buffers to deter gentrification and displacement alongside grassroots and community-led planning practices (Draus et al. 2019). The idea of wastelands is not only reserved to post-industrial sites but is also used in reference to riverine and wetland systems. In a study of urban greening in Melbourne Australia, researchers explore how strategies that attempt to "regenerate" overlooked and neglected spaces in urban areas fail to recognize historical and systemic social-ecological injustices and can contribute to rates of gentrification and displacement (Kelly et al., (2022b). They caution urban developers who pursue a "cosmetic form of justice" through urban greening and to instead center the voices of local communities in the planning process.

In literature looking specifically at urban space or cities, vacant land is valued and characterized in varied ways – as empty space (Gandy, 2016; Riley et al. 2018), or as productive space (Anderson and Minor, 2017; Del Tredici, 2010; McPhearson et al. 2013). In a study of urban vacant land In New York City (NYC), Kremer et al., 2016 point out these parcels (9.7% of total land area) are not included in annual surveys of forest land or greenspace despite the critical ecosystem and social services provided to vulnerable communities. However, it is important to note that when informal wild spaces are recognized for their own value or to counter gentrification, they can also be co-opted and controlled through surveillance and by removing public access (Sandberg, 2014). Fundamentally, narratives that seem aligned, such as preventing the creation of new natures to avoid green gentrification by protecting the existing nature, can create displacement if done through a 'controlling' and 'gated community' approach Sandberg (2014).

There are also several legal and policy implications explored in the literature. Schoukens (2017) for instance highlights a critical opportunity to revise conservation policies to include undeveloped and vacant lands as a process of "reconciliation ecology", or the practice of reconciling the loss of biodiversity in human-dominated systems (Rosenzweig, 2003). Schoukens highlights ways that informal greenspaces and former industrial sites could support Indigenous-led biodiversity and conservation efforts that can help protect endangered species and balance some of the effects of maldevelopment. This is a trend also identified for former agricultural lands now "abandoned" (Pace Ricci and Conrad, 2018). In most places, policy and planning has yet to develop new or revised land use zoning and policy mechanisms that allow for local communities to envision future uses of underutilized agricultural lands (e.g. as community allotments and gardens), which researchers argue can disproportionately impact overburdened communities nearby.

From an ecological gentrification/displacement point of view, as Merwin and colleagues (2022: 2) argue, '[r]arely is the current ecological quality of brownfields preserved or even considered, despite the common presence of volunteer species and ongoing ecosystem processes', prompting the discussion of what is valued and not valued amongst conservation and land managers. Filibeck and colleagues (2016) demonstrate through ecological surveys how social entanglements in a ruderal site in Rome, rich in self-sustained biodiversity, increased community capabilities through social cohesion and cooperation, but a disregard for the ruderal, spontaneous vegetation decreased the ecological diversity and resilience by 50%. Wastelands, as the contemporary products or post-productive natures of past human activities, show us 'how complex social and political planning processes interact with changing and ephemeral views of nature and its physical manifestations in the landscape' (Lisberg Jensen and Ouis, 2008; 172). Contested and negotiated social-ecological values through practices of public participation, modern planning processes and contemporary nature narratives shape the future of these spaces into a reconstructed or redesigned nature that evolves from 'a *landscape of production* to a *landscape of consumption*' (Lisberg Jensen and Ouis, 2008; 180; emphasis in original).

3.3. Urban wild spaces for social-ecological mobilizations and new sensitivities

A counter narrative emerged in studies that critically examined notions of regeneration as an opportunity to value and establish new connections with novel ecosystems, and to drive social-ecological dialogue marked by grassroots movements and community cooperation. For example, addressing regeneration through an environmentally-sensitive approach that recognizes the value of diverse ecosystem dynamics, adaptation, and the human and more-than-human relations which challenge neoliberal and sustainability discourses (Kitchen et al., 2006). Through a study of 19 novel ecosystem sites in 13 cities in Italy, Trentanovi et al., (2021a) documented the tension between community grass-roots movements' socio-ecological values and futures in four l sites and the State's (landowner) capitalist valorization of abandoned land. The study points to the critical issue of capabilities explored in this case, identified through an emergence of community mobilization, capacity building through social-ecological interactions/dynamics, empowerment, and a (re)valuing of devalued life forms. The authors also identified a lack of recognition of spontaneous urban woodlands in planning frameworks, erasing their important role in providing benefits for nearby residents (Trentanovi et al. 2021a; 2021b). These, as well as several other studies highlight the importance of community involvement in making these sites visible and to reduce conflicts generated through unequal power relations and strategies developed by the community to reduce these conflicts (Pietta and Tononi, 2021), for other sectors of society in recognizing their important role as providing ecosystem services (McPhearson et al., 2013; Merwin et al., 2022; Sikorska et al., 2020; Trentanovi et al. 2021b; Wlodarczyk-Marciniak et al., 2020), and improving multispecies assemblages and resilience (Carver and Gardner, 2022; Gesing, 2021; Kennedy, 2022).

Aligned with the narrative of regeneration, other studies explore how the use, planning and governance of novel ecosystems can reconstruct processes of power, extraction, transformation, ruination and succession, and highlight the human-nonhuman fluxes that shape these landscapes. In a sense, these studies offer a way of unpacking embedded injustices by looking into the past and reconstructing the historical social-ecological-technical interactions of depletion, extraction and ruination (Carver and Gardner, 2022; Solórzano et al., 2017; Stoetzer, 2018) and enquiries around place-making and socio-material practices (Erixon Aalto and Ernstson, 2017; Evans 2007; Gesing, 2021; Pietta and Tononi, 2021; Trentanovi et al., 2021a;b). These studies are also positioned within a broader lens of justice in which a multispecies understanding is brought forward. As such, this theme shows new opportunities and new ways of understating these novel ecologies. In Berlin, the Tempelhof Airfield site, reimagined as a public park after its decommission in 2008, offers a salient case for how to recognize and value non-human and human relationships through sensory experiences and conservation of a brownfield site that can be declared "green" with no remediation necessary (Carver and Gardner, 2022). Opposite to this view, but also through a celebration of multispecies practices, Gesing (2021), argues for environmentally just coastal creation in New Zealand and working with/cultivating native nature through botanical decolonization 'understood as more-than-human approaches to postcolonial (environmental) justice' (p. 217).

Solórzano et al. (2017) trace retrospectively two of the largest urban forests in the city of Rio de Janeiro, Brazil, through their beginnings as charcoal-producing landscapes, then farming and followed by an ecological succession enabled by seeds dispersed by remnant forests and

animals. Depleted water sources and other critical ecosystem functionalities created a space for new life to flourish. Similarly, tracking the historical distribution and dynamic changes of trees over a 62-year period in Massachusetts showed that trees emerged and flourished during human economic depressions, and lost with economic prosperity (Healy et al., 2022). These studies show alternative ways of unpacking layers of landscape transformation and challenging what we value as pristine nature are actually entangled with stories of injustice, restoration and self-organizing/sustaining life. Bringing to light these human-nonhuman entanglements, Stoetzer (2018) shows how post-war ruderal flora growing in the rubble of a Post WWII Berlin were not seen as intruders, but as guests, as those setting the stage for ecosystems to flourish, providing habitat to species, and allowing new ecosystems to establish. In a sense this disturbed landscape and related injustices, create new opportunities for life. Ruderal plants were also seen as a sign of a changing climate, of cities becoming warmer, and of global connectivity with people and seeds migrating across regions and continents (Stoetzer, 2018). These ruderal ecologies, as expressions of spontaneous ecological self-organization in cities, "offer a useful device to not only think differently about emergent urban landscape forms but to also embrace a multispecies perspective" in embedding resilience thinking in urban planning and design (Kennedy, 2022).

The majority of these studies reflect and unpack the narratives within planning discourses and how they create tensions and conflicts between 'development' and conservation. These are dependent on '.what counts as nature and what does not' (Evans, 2007: 147), on the 'landscape itself becom[ing] an active narrative element' (Erixon Aalto and Ernstson, 2017; 309), and narratives of wellbeing and liveable futures that neglect past and present environmental damages (Kelly et al., 2022a; 2022b). With changing narratives of what is urban nature, 'the main relevance of emergent ecologies on such sites lies not in their physical-ecological functions and performances, but in their aesthetic and representational agency' (Langhorst, 2014: 1111).

4. Discussion

4.1. Urban novel ecosystems: trends, gaps and emerging discourses

This review has showed that whilst many of these novel sites lie dormant for decades, in a state of ecological flourishing, growth and recolonization, when social-ecological entanglements emerge, they tend to resurface histories of ecological conflicts, contrasting, and power imbalances that create and perpetuate injustices. Many of the urban novel ecosystems studied carry historical legacies of exploitation and disinvestment, in many ways the by-products of the industrial, Anthropocene era. These past injustices, at present manifest as contestation and resistance - a reflection of the conflicts that arise from issues of who has access to these spaces, who benefits from these spaces, who owns these spaces, how these spaces should be managed, and how can social and ecological injustices be repaired or restored. This review, however, also highlights that within and across these spaces there is capacity for positive transformation and may inspire new understandings of our relationship to 'urban nature'. Scheidel et al. (2018: 590) tell us that ".conflicts hold tremendous power for change by mobilizing social forces that can contest, politicize and transform such unsustainabilities". Yet, as our review also shows, sometimes shining a light on the value of a site can also result in a devaluation of the novel ecologies existing at a site.

Matters of what is recognized as valuable was deeply linked to the theme of perceptions. As such, recognitional injustice - what different stakeholders value in a site is sometimes more about its potential to create what they want, without valuing what is already there. As Filibeck and colleagues (2016) showed in their study, community involvement prevented a disused demolition waste landfill in Rome (Italy) from development, but their perceptions of what is of value, caused a 50% biodiversity decrease of vascular plants that had spontaneously flourished for years. Calderón-Argelich et al., 2021 review on how environmental justice questions are integrated in urban ecosystem services studies show that there is a substantial focus on distributional justice. A major theme in our review also highlighted a focus on issues of distribution, but also highlighted the importance of linking the different dimensions of distribution to perceptions and preferences - without this, it is difficult to change deep-rooted ways of assessing and studying the relations between urban ecosystems, socio-economic dynamics and issues of justice. Studies around perceptions have shown in this review that urban novel ecosystems, in particular brownfields, wastelands, vacant lands, and others associated with abandonment and dereliction, carry a stigma that prevents them from being recognized as valuable social-ecological spaces which perpetuates their invisibilization further. Although invisibilization is not necessarily a negative aspect, a devaluation by different stakeholders allows their future to be dictated by other interests, rather than leveraging 'exploiting' their potential as wild spaces with the capacity to provide multiple social-ecological benefits. Perceptions of specific species as weeds, regardless if they are or not, can instead put species and ecosystems at risk in urban habitats. Not recognizing a species and its connection to different habitat types and inter-dynamics with other species and across the ecosystem, including ruderal habitats, also invisibilizes the ecosystem and the other species that are part of that novel habitat (Hardion et al., 2015).

This review exposed many gaps in the literature related to the different dimensions and theories of justice. For instance, there were no discussions of intergenerational justice. Intergenerational justice is closely linked to temporality and although notions of how these spaces are placed in time, in an ephemeral state, these were not strongly connected in the literature with intergenerationality. Temporal justice has been identified as a critical dimension of justice that cuts across time, past, present, future, is space-bounded and constantly changed by local interactions and multi-scalar global processes, and further highlights the importance of considering social-ecological interactions in determining a justice-focused approach to planning and design (Langemeyer and Connolly, 2020).

In our review, studies that used methodologies to trace past and present social-ecological entanglements, did provide a window into how a multispecies lens to intergenerational justice could help unpack the past to see ways forward. A possible way forward relates to the character of urban novel ecosystems of impermanence, ephemerality, 'waiting to become something which they should be and not what they are'. This makes them the posterchildren of capitalist activities, neoliberal agendas and bearers of deep injustices. This 'awaiting', places them in a state of vulnerability, of imminent change into something they do not want to become, because they have become what they are, self-sustaining, self-organizing ecosystems. In line with this idea of temporality and change, the literature is starting to shine a light on the capacity of these sites to provide ecosystem services and green space alternatives where formal spaces are scarce, it doesn't recognize explicitly the role of wild informal spaces in addressing the climate and biodiversity crises, but also presents opportunities for improving our knowledge of these spaces in research and planning terms.

Of critical importance in this review was to emphasize how social and ecological displacement both tend to be externalities of regeneration discourses. Development narratives around wastelands, brownfields, vacant lots and urban change tend to produce socio-economic disadvantage and green gentrification and displacement, both of people and nonhuman species. Similar to what Arcari et al. (2021) found in relation to invisibilized animals and urban nature in which they found that notions of care need to be more critical in regards to how and which species are represented, and which ones foster relations of care and stewardship. Unpacking social values, attitudes, behaviors and assumptions towards novel ecosystems and their potential for rewilding cities can help uncover which and why some systems are undervalued, underrepresented, or considered in a certain way. As Jorgensen and

Tylecote (2007) argue, ambivalent landscapes can generate contradictory or ambivalent perceptions and attitudes towards urban wilderness, underscored by an assumption that we are at war with nature, and thus requires human control. All this despite increasing recognition that wild spaces hold multiple meanings across space and time and enable agency for humans and other species enmeshed in these habitats.

4.2. A multispecies justice lens to engage with urban wild spaces: a framework for planning

Multispecies justice is a useful lens for thinking through the future of wild spaces and novel ecosystems, and how to equitably address historical and emerging injustices. Increasingly scholars leverage multispecies justice to expand and inform related concepts such as climate or environmental justice because it has the potential to be more intersectional, inclusive, relational and cosmopolitical (Tschakert, 2022). This is due in part to the ways in which multispecies justice or multispecies thinking radically approaches the idea of subjectivity and the subject of justice, advocating for a more inclusive account of more-than-human actors within the scope of recognitional justice. This fundamentally redefines the grounds and politics of recognition, and accounts for the inherent agency and needs of life forms other than human. Additionally, it places the focus of justice not on humans or more-than-human communities, but rather toward their interdependence with the goal of mutual flourishing.

In relation to novel ecosystems, multispecies justice allows for a consideration of both the human dimensions of injustices related to and forged from wild spaces, and the injustices inflicted upon more-than-human life (Chao, Bolender, Kirksey, 2022). An multispecies justice lens acknowledges even organisms we deem alien and invasive, as having agency, power, and rights (van Dooren et al., 2016) and invites us into the social worlds of other organisms – taking into account the varied ways in which they experience and know the world (Tsing 2015). Scholars such as Donna Houston and colleagues (2018) push this further and promote the idea of "multispecies entanglements", highlighting the value of encounters with novel and wild spaces to build empathy and relationships with organisms we may deem a nuisance or invasive (Kennedy, 2022). This may allow various stakeholders to envision strategies for communicating with other organisms, and more equitable practices of translation and inclusion (eg. multispecies urbanism) that are decolonial and critical of neoliberal practices that may discount the contributions of more than human actors (Tschakert et al., 2021). And thus, providing a means to co-vision mutual flourishing through inclusion of nonhumans in decision-making.

In Box 2 we have brought together justice concepts from the literature and placed them in relation to themes and recommendations that emerged from this review. Further below we merge these ideas into four recommendations that emerged from the literature to inform future planning, use, maintenance and design of novel ecosystems and wild spaces from a multispecies lens.

4.2.1. Planning and designing for and with novel ecological systems

Novel ecosystems and wild spaces can provide a range of social-ecological benefits (Baker, 2019; Clement, 2020; Collier, 2015; Collier and Devitt, 2016; McPhearson et al. 2013; Merwin et al. 2022; Santana, 2022; Teixeira and Fernandes, 2019; Vanstockem et al., 2018), can serve as a model for regenerating disturbed landscapes (Kowarik, 2018), and can enhance the resiliency of social-ecological communities and connections (Turner et al. 2003). Robin Wall Kimmerer (2015) argues damaged landscapes can instead be a "partner in restoration", not only for the critical ecosystem services they provide, but also for the unique social-ecological role they can play for human and more-than-human communities (Higgs, 2012, Childers et al., 2019, Del Tredici, 2010, Davis et al. 2015). Kennedy, 2022 proposes the concept of 'ruderal resilience', noting the potential for leveraging the emergent traits that novel ecosystems present such as the ability to rapidly adapt, tolerance to extreme climates, and ability to thrive in Anthropogenic conditions. Reconciliation ecology was also highlighted as an effective means to reframe conservation and biodiversity strategies, in some cases in ways that leverage informal and novel ecologies, rather than assume they have no social or ecological value. Although nascent, examples are emerging and have begun to inform new land management and conservation practices that promote novel ecosystems as part of a broader matrix of ecosystem adaptation and regeneration, which can enhance biodiversity, and provide a range of social-ecological services (Kattwinkel et al., 2011; Kowarik, 2018; Rall and Haase, 2011). Others point out that this can provide a salient means to reconcile the biodiversity losses attributed to urbanization and human activity (Rosenzweig, 2003; Schoukens, 2017), consider both economic and ecological considerations when identifying conservation and biodiversity goals and alleviating tensions (Schoukens, 2017).

4.2.2. Multispecies approach to co-governance and policy-making

Multispecies justice and design is increasingly used as a framework for planning. Bracke et al. (2022) for instance discuss the emergence of multispecies perspectives in landscape design and architecture, presenting strategies for what they call "co-becoming" with landscape systems through a case study of disturbed environments in the Eure valley in France. Through a series of speculative design exercises, they identify actionable planning strategies that engage with human-nonhuman relationships, politics, and more-than-human conceptualizations of space. Similarly there is emerging research on practices of co-governance and participatory design strategies to invoke the voices of other species in imagining "multispecies commons" particularly in urban green spaces where the impacts of urbanization are most pronounced (Haldrup et al., 2022). The Gardiner Lab in Cleveland Ohio for instance is researching the potential for repurposing vacant lots as pocket prairies to promote increased pollinator activity, recognizing not only the distributional equity concerns related to access of greenspaces but also habitat provisioning for nonhumans (Kwok, 2018, Turo and Gardiner, 2019). Fieuw et al. 2022 offer a horizon scan of "more-than-human approaches" to urban design and development, highlighting the potential for biodiversity sensitive urban design (BDUD, Garrard et al., 2017) and animal-aided design (AAD, Weisser and Hauck, 2017).

4.2.3. Multispecies justice as a lens to confront gentrification and 'new' nature narratives

Several scholars advocate that planning considerations need to take into account both the social and economic dimensions of redevelopment, as well as an acknowledgement of the ecosystem services provided by the novel ecosystems prior to redevelopment (Moyles and Craul, 2016). Other studies advocate for planning to consider "just greening" strategies such as the establishment of informal green space buffers to deter gentrification and displacement alongside grassroots and community-led planning practices (Draus et al. 2020). Ways to better understand how displacement and devaluation occur include widening the recognition of the value and untapped potential of ecosystems in brownfields, in particular from conservation professionals and land managers (Merwin et al. 2022).

Gentrification is deeply tied to discourses within disciplinary fields and professions of what is counted as valuable, worth protecting. Calls for unpacking the narratives within planning discourses within the context of development or conservation practices can help us better understand what and why we value some lives and systems in nature and not others (Erixon Aalto and Ernstson, 2017; Evans, 2007; Kelly et al., 2022b; Langhorst, 2014). Sometimes, for example, preserving novel ecosystems to prevent gentrification, can lead to other forms of displacement by gatekeeping nature from the community (Sandberg, 2014), or rather differently, novel eulogies are seen as guests, new beginnings, rather than intruders (Stoetzer, 2018). Seeing these wild, novel spaces as being subjects and by-products of injustices, but also

Box 2
Summary of anthropocentric and multispecies justice-oriented framings from a novel ecosystems understanding and their implications for urban planning and governance.

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allowing the emergence of counter-hegemonic voices and practices that see potential and value in these spaces in and of themselves, provides a tool to expose issues of power, displacement and exclusion of social and ecological communities in light of the neoliberal agenda driving urban development.

4.2.4. Mediate perceptions of wildness through cues of care

To foster greater awareness of the social-ecological justice issues and potential benefits novel ecosystems provide, promoting new forms of stewardship and improving perceptions of novel ecosystems is critical. In many instances, researchers highlight the implications of violent and war-like language, narratives and cultures of fear used to demonize novel ecosystems and wild spaces (Lindstrom et al., 2016). Many articles advocate for increasing awareness (members of the public, landowners, developers and planning/design officials) of the benefits of these spaces, e.g. ecosystem services, well-being (Kelly et al., 2022a; 2022b; Kim and Kang, 2019; Kim et al.'s 2017; Meenar et al., 2022; Włodarczyk-Marciniak et al., 2020). Others argue for adaptations in how stakeholders discuss the appearance of novel ecosystems to reduce negative perceptions of wild spaces (Kowarik, 2018) and a greater understanding of informal green spaces as places of meaningful encounter to cultivate an ethic of coexistence with other species that they would otherwise perceive as unwanted (Rupprecht 2017b). A multispecies justice approach is useful in that it calls into question the lack of recognition and how the devaluement of novel ecosystems becomes part of a larger societal attitude or policy formations that gives rise to these spaces being invisibilized and easily erased when new narratives of development emerge (Pietrzyk-Kaszyńska et al., 2017; Rupprecht 2017b; Kim et al., 2020; Trentanovi et al. 2021a; 2021b). Joan Nassauer's (1995) cues to care framework is useful in this sense, but a multispecies justice lens may provide even greater insight into how to reframe our relationship with urban wild spaces as they become more commonplace and cosmopolitan. Multispecies justice provides an open canvas for "[d]eveloping a trans-species ethic and empathy in cities is about changing the basic unit of reference of what counts to be human, but also moving beyond the centrality of humans as the defining reference point for ethical action" (Steele et al., 2019). Engaging with novel and wild ecosystems in cities can help us move in this direction.

5. Conclusion

As urbanization accelerates and the presence of novel and wild spaces becomes more commonplace, there is an increased need to think critically about the use, governance and management of novel ecosystems, as well as the tensions and injustices they can provoke. Our review presents several emerging challenges as well as potential solutions, which carefully consider important questions about how justice is understood, analyzed and framed. We identified three primary findings from the review, namely that the attitudes and perceptions of wild spaces can engender and give rise to injustices, 2) attempts to regenerate or replace novel ecosystems may result in their devaluation or displacement of human and nonhuman communities; and 3) the potential for these spaces to reinvigorate new relationships and understanding of nature in a time of disturbance and Anthropocentric change. We also argue that a multispecies lens is useful for deconstructing the consequences of neoliberal and human-focused decision-making and planning, and as a means to expand the subject of justice to be inclusive of more-than-human actors.

Key recommendations (Box 2) from the literature highlight critical opportunities to repair our relationship and perception of wild and novel ecologies. Many of the reviewed articles advocate for an integration of novel ecosystems into land use planning and governance in ways that promote novel ecosystems as spaces of agency, self-regulation, self-assemblage, and as a future model for urban greenspace design. Similarly, a multispecies justice lens can be advantageous in devising ways to include the needs and voices of more-than-human communities in decision-making and governance of novel ecosystems, as well as the unintended by-products of their development and displacement. In reconceptualizing novel ecosystems not merely as wastelands but rather as places for mutual flourishing, stakeholders can advance new ways of valuing nature and enact new sensitivities and ecologies of care which can lead to multiple long-term benefits (de la Bellacasa, 2017). It is important however to note the limitations and challenges to implementing these recommendations. In some cases, management of naturally-occurring and "invasive" vegetation is needed to conserve some forms of biodiversity and avoid economic damages. In other cases, stakeholders must seriously consider the social and economic challenges of ongoing stewardship, and the challenge of reframing negative perceptions of novel ecosystems that are pervasive in many communities, among other issues.

Future directions for research and practice include documenting the biodiversity in these sites in the context of our climate crisis, case studies for effective use and planning that incorporate multispecies justice dimensions, as well as better understanding how novel wild ecosystems can result in new injustices or coalesce past and present injustices or inspire multispecies kinship in a time of extinction.

CRediT authorship contribution statement

Melissa Pineda-Pinto: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing. **Christopher Kennedy:** Data curation, Formal analysis, Validation, Writing – original draft, Writing – review & editing. **Marcus Collier:** Formal analysis, Validation, Writing – original draft, Writing – review & editing. **Clair Cooper:** Data curation, Formal analysis, Validation, Writing – original draft, Writing – review & editing. **Fiona Nulty:** Visualization, Data curation, Writing – review & editing. **Mairead O'Donnell:** Data curation, Formal analysis, Validation, Writing – original draft, Writing – review & editing. **Natalia Rodriguez Castaneda:** Data curation, Formal analysis, Validation, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.ufug.2023.127902.

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