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Conclusion—Biodiversity for the People

Future Directions for Urban Biodiversity Conservation

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Travis Gallo[¶], and Nyeema C. Harris[#]

Conservationists have long acknowledged that their field is values-based (1). There is nothing “objective” about prioritizing management actions to increase hunting or fishing opportunities, to increase the diversity of species present, or because a given species is listed as endangered. We manage species for consumptive purposes, to change their listing status, or for any other reasons that align with societal values. Doing urban conservation is a scientific necessity to achieve broader conservation goals, and environmental justice is a necessary tool to ensure the success of those goals. However, a superficial or performative implementation of environmental justice principles by conservationists solely to combat the biodiversity crisis will inevitably fuel the same exclusionary practices that have perpetuated environmental harms on minoritized communities for centuries (2). Exercising legitimate environmental justice action relies on authentically embedding just values into how the discipline operates, from the processes that govern what we decide to protect, to the ways in which we build and engage with community. Consequently, conservationists across the globe must acknowledge that justice is the central tenet to their discipline.

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Our collective challenge rests in our ability to produce malleable, multipurpose, adaptive strategies and tools that benefit both human and nonhuman entities. Such an agenda will require uncomfortable conversations about recalcitrant systems of power and oppressive authorities that limit successful outcomes of biodiversity conservation writ large (2). We must redefine what biodiversity is and who has the right to make such assertions, the conscious and unconscious biases that dictate the conservation actions we elevate over others, and what types of knowledge we accept as objective or superior (2–4). Moreover, conservation scientists and practitioners, even in cities, have been reluctant in past decades to infuse political and scholar-activism into research and decision-making processes, for fear of appearing as partisan, unobjective actors that use state-appropriated funds for personal political agendas.¹ Such fears implicitly justify impediments to environmental justice and equity discourses that explicitly interrogate the role of White supremacy, sexism, xenophobia, homophobia, and ableism in perpetuating environmental harms and inequities.

There is a wide multiverse of definitions of, experiences of, and approaches to biodiversity conservation. Cities, more so than any other

¹ Yale School of the Environment editorial on political will for climate change action (<https://environment.yale.edu/news/article/building-public-and-political-will-for-climate-change-action>).

human-dominated landscape, are perfectly situated to assume a leading role in developing the figurative cookbook for how we elevate multiple knowledges, epistemologies, cultures, and relationships with biodiversity and nature (5). And, despite what feels like a Sisyphean exercise in combating the inequitable development and societal practices that hinder effective biodiversity conservation, there is cause for considerable hope. Emerging discourses in the last decade alone have begun to interrogate who benefits from urban conservation actions (3), how to broaden urban greening efforts to include anti-racist and emancipatory approaches (6,7), spotlight case studies for authentic and intentional coproduction with impacted communities of color (8), and redefine what biodiversity is to equitably distribute the benefits and ecosystem services provided therein (3). Literature addressing the urgent need to embed environmental justice principles into sustainability practice (9), science disciplines such as ecology (10), urban planning and infrastructure (11), and nature-based solutions (4,12,13) has also accelerated. Taken together, these relevant perspectives and empirical works suggest we are at the precipice of a global paradigm shift in how we perceive our natural world, biodiversity, and our role in this entirely complex tapestry.

The next critical step to a transformative, justice-infused urban conservation science will require a radical reimagining of Western societies' relationship with biodiversity and nature. Such a transformation will require revolutionary interventions in decision-making, policy, and governance structures that are both robust enough to withstand drastic environmental changes while simultaneously elastic enough to mutate as conditions change (14,15). This transformation must equally include a more diffuse power structure and inclusive enterprise. Conservation as traditionally constructed is ill-equipped to achieve such a Herculean task, despite the equally superhuman efforts of conservationists to conserve sensitive habitats, ecosystems, and species (16). What feels like fighting a losing battle, however, is only because conservation science is still struggling with creating robust strategies that comprehensively account for the most consequential ecosystem engineer on this planet: people.

The emergence and continued maturation of urban biodiversity conservation may provide the much-needed antidote to our contemporary dilemma.² Since its inception, urban conservation has been compelled to consider how human-nature relationships shape fundamental properties of the landscape. Conservation strategies and implementation legislation enacted by cities across the globe emphasize this fact, from Atlanta, GA, USA to Singapore (8,17,18). Though the relative successes and barriers of urban conservation programs vary as a function of sociopolitical systems, local and national ordinances, cultural views on conservation efforts, and economic institutions, such programs are unified in the ideology that: (1) society and the environment are both interdependent and interconnected; (2) decision makers and practitioners must work with local communities to effect positive change; and (3) implemented strategies need to be hyper-agile to morph and grow with society in mind. Still, even the most financially supported and politically backed programs are grappling with effectively meeting the needs of the most marginalized people in society. Hence, the central quandary of urban conservation resurfaces: how do we promote biodiversity conservation in cities that also elevates justice and equity for those most impacted by historical, current, and future environmental harms?

One of the hard truths that the entire conservation community must contend with is that we, too, are but one group among the many diverse, informed, and justified communities that have a tremendous stake in saving our natural world (2). Too often has knowledge from scientific institutions been elevated over other ways of knowing, often perpetuating environmental harms, and sabotaging the long-term conservation success of implemented recommendations. These include traditional ecological knowledge, Indigenous ways of knowing, and experiential and place-based knowledge, all of which stress that the multitude of diverse experiences with nature create a much richer tapestry

² The Nature Conservancy on elevating cities as the solution to biodiversity loss (<https://www.nature.org/en-us/newsroom/urban-expansion-impacts-for-biodiversity-planning-yale/>).

for being in community with biodiversity. Thus, in this closing chapter we further emphasize that decentering narrowly-focused conservation plans that rest almost exclusively in the scientific objectivity of the elite and privileged few are destined to fail.

We end here by providing a set of recommendations and spotlight what will be required of us collectively to truly build ecological resilience in our cities, suburbs, towns, and megapolitan areas. Importantly, the “us” in this context is both expansive to include the collective of diverse and interconnected communities across urban environments, as well as specific to local communities of practice and place-based efforts. First, we discuss the need to center pluralism in our conceptions of biodiversity, and how doing so allows for greater equity and inclusivity in conservation efforts. Second, we call attention to the role that other disciplines of research and practice can play in facilitating urban biodiversity conservation, emphasizing that breaking disciplinary silos is required for transcending myopic solutions. Third, we address how creativity and imagination are critical to envisioning just future cities, spotlighting how equitable practices and structural design are necessary for implementing nature-based solutions. In parallel, we underscore how the pervasive impacts of capitalism, have generated the environmental ills we currently face noting that our efforts to move toward an environmentally just city will require that we dispel racial capitalism (i.e., the concept that race is the primary factor in structuring social and labor hierarchies in capitalist societies) (19). Finally, we conclude with critical questions that will guide future urban conservation discourses, emphasizing that collective action will be required for saving the natural world, even if current generations may be unlikely to experience the benefits of our labor.

Centering a pluralistic view of biodiversity

How and why do we define biodiversity? This is an elementary, yet profound question situated at the nexus of all the solutions and policy recommendations addressed in the previous chapters. At its

core, biodiversity is a unit of measurement we use to practice conservation; hence, having a defined entity provides a target to achieve. Consider for a moment the push to restore sensitive habitat or establish wildlife crossings to increase landscape connectivity. In those examples we assume that “biodiversity” will increase because restoring habitat creates more ecological niches for a wider array of species to survive, or wildlife crossings will bolster landscape connectivity enabling greater permeability and movement across the urban matrix. In both instances, the implicit, perhaps unconscious assumption, is that biodiversity equates to more species (i.e., greater species richness). This definition is not necessarily wrong or misplaced: alpha diversity metrics like species richness have been a useful and robust statistic for measuring community and ecosystem function (20). Ironically, species richness is simply one definition of biodiversity. Within the ecological sciences alone, there are multiple ways of calculating biodiversity across scales—including alpha, beta, and gamma diversity. The biological sciences broadly consider biodiversity at three distinct scales as well: genetic, species, and ecosystem diversity (21). Case in point: the natural sciences already have multiple definitions at various scales for what biodiversity is.

These details are not trivial and have economic, conservation decision-making, and governance implications. Thus, the specific interpretation of biodiversity that is elevated in the decision-making process matters considerably. For example, if an endangered species is discovered on a small collection of urban green spaces, conservation professionals may support legislation that effectively reduces human activity in those spaces, using their selected definition as justification to bolster such policies. The enacted policies to protect the sensitive habitat, however, may violently displace residents or reduce their access to nature’s benefits in urban environments, leading to a negative feedback loop that further annexes the most marginalized communities from experiencing the beneficial ecosystem services provided by urban nature. In this instance, the interpretation of biodiversity that gives greater weight to species that are endangered superseded the communities’ well-being, perpetuating insidious environmental harms. Sadly, this hypothetical

scenario highlights the very real and repeated injustice of conservation-induced displacement (22) that is intrinsic to colonial and postcolonial conservation efforts.

Singular, narrow definitions of biodiversity not only have the potential to perpetuate systemic injustices faced by minoritized communities, but also severely compromise collaborations and community engagement efforts to support conservation agendas (3). Narrow definitions are frequently used to undercut the legitimacy of other culturally or experientially situated definitions of biodiversity, invalidating diverse perspectives that are no less valid than academic definitions. As a result, conservation and management organizations run the risk of further alienating local communities from the decision-making process, limiting (a) the power of those communities to effect change in their own neighborhoods; (b) the long-term success of conservation actions; and (c) the overall legitimacy of biodiversity conservation policies for society (3).

Throughout this volume, we and other contributors have stressed the significance of infusing justice and equity into conservation practices and policies; both because it is morally just and because it is the necessary catalyst for effective urban conservation. Without it, such agendas are doomed to fail. As researchers in the conservation space ourselves, it is imperative to call out the biases that assert academic knowledge as superior to other ways of knowing. A significant part of biodiversity conservation's reckoning thus rests in working to restore trust with disaffected communities, including Black, Indigenous, and other persons of color. Such work can only be initiated by authentically validating differing world views, perspectives, and definitions of biodiversity.

Centering a pluralistic view in urban biodiversity conservation opens space for diverse, complex, and culturally meaningful conceptions of a biodiverse world and our place in it. Rather than considering what singular definition to use as the defining factor, multiple approaches—including social, cultural, spiritual, and quantitative—can be used to identify common nodes of collaboration among conservationists and community members (23). The coproduction of shared common goals thus emerges from placing less emphasis on the “how?” and

“what?,” and more emphasis on the “why?” Relaxing rigidity around how biodiversity is defined clears the way for answering the question of why we choose to conserve certain species, and whom those actions are for (4)? This is akin to a poignant line in the film “Black Panther: Wakanda Forever,” where both the antagonist Namor and the previous film’s antagonist Killmonger state that “How is never as important as why.”³ Moreover, a pluralistic perspective effectively democratizes the decision-making process and decenters certain forms of knowledge. As a result, conservationists, practitioners, and academics must cede any perceived moral or intellectual authority (i.e., power) in laying claim to how people should perceive biodiversity and nature (3).

Pluralism also supports more effective scaling of biodiversity conservation policies. Urban conservationists are frequently considering how policies work at multiple scales (21,24) and whether those policies are equipped to deal with the interconnections of societal and ecological systems (25). Policies built on a pluralist foundation confer legitimacy to the varied intersectional identities of the communities vested in those policies. An urban conservation plan that validates and works to abolish the oppressive constraints of sexism, homophobia, ableism, classism, xenophobia, and racism in society is equally buoyed by the reciprocal support of a diverse coalition of stakeholders. This poetic positive feedback is reminiscent of biodiversity itself, in which greater diversity fortifies ecosystem resilience and bolsters function and health (26). Finally, pluralism allows humans as a species to simultaneously celebrate human–biodiversity relationships and consider the value of urban ecosystems beyond their utility to society. Equally holding the valuation of human and nonhuman organisms as interconnected beings echoes both the 17 foundational principles of Environmental Justice (27), as well as Indigenous practices and rituals,⁴ which

³ Rolling Stone perspective on the movie “Black Panther: Wakanda Forever” (<https://www.rollingstone.com/tv-movies/tv-movie-features/black-panther-wakanda-forever-mcu-colonialism-1234628690/>).

⁴ Website from the Nature Conservancy addressing Indigenous conservation practices (<https://www.nature.org/en-us/about-us/who-we-are/how-we-work/>).

deserve substantial deference and elevation. Necessarily, Indigenous-led urban conservation should assume a leading role, as generations of Indigenous peoples globally have refined conservation strategies that colonialism and urban development have forcefully pushed to the margins of society (28,29).

In sum, expanding the definition of biodiversity to include the multitude of variants paves the way for embedding the practice of coproduction into conservation programs (7).

Expanding the disciplinary table

This volume covers a wide breadth of interdisciplinary fields, making a concerted effort to illustrate the interconnectedness of these previously siloed disciplines. Despite the broad expertise represented by the contributors, there are invariably disciplines and synergies that were not captured in prior chapters. It is our hope that future works and literature will continue to explicate the various disciplines that can provide support and insight in building biodiverse, resilient cities. Breaking silos within academic disciplines will be necessary to improve urban conservation efforts, and such a task may be facilitated by building transdisciplinary coalitions that produce unorthodox solutions. These considerations notwithstanding, some of the most impactful changes will occur outside of the ivory tower of academia or scientific practice more broadly, demanding that we intentionally create space for community members and laypersons with less conferred privileges and capital to join a more expansive and inclusive table. Manifesting such welcoming spaces will further require interrogating the structures that prevent other professionals from contributing to urban conservation discourses, as well as deep reflexivity in the systemic constraints that hinder academic and governmental professionals from biodiversity conservation action.

Centering environmental education and opportunities for experiential learning is arguably one of the highest-priority areas. Urban environments are

the ideal landscapes for cross-generational learning, providing opportunities to freely observe, explore, and hypothesize their social-ecological reality (30). Lesson plans coproduced among urban practitioners, researchers, and educators can subsequently serve as the scaffolding for a student's learning. For instance, *Wildlife Neighbors*⁵ is an informal education program developed by the Applied Wildlife Ecology (AWE) lab at Yale School of the Environment and the Detroit Zoological Society funded by the National Science Foundation. The program leverages an extensive wildlife camera survey to build science capacities and identities, promote environmental stewardship, and enhance sense of place in urban youth of metro Detroit.

Educators trained in effective science pedagogy from preschool to adult education, in formal and informal settings, will have extraordinary insight into the most effective ways of demystifying the interconnectedness of urban nature, society, and environmental balance (31). Because of its malleability in strategies and tools, urban conservation may be the perfect medium for a lesson plan in conservation more broadly that transcends age, class, gender, country of origin, and mobility. Moreover, the development of teaching modules that center nature experiences of students will give them agency in their learning, bolstering their intrinsic valuing of urban nature and thus their willingness to conserve and protect it. Urban biodiversity and nature experiences can also reduce physiological stress markers in children, highlighting the public health benefits of integrating urban conservation practice with K-12 pedagogy (32,33).

Importantly, this learning exercise is a two-way street, as urban conservation researchers and practitioners can deepen their relationships with local communities by listening to students' experiences of nature. Youth living in various cities across the globe express exceptional interest in their natural world and make profound ecological observations that are not constrained by academic ways of knowing. Fresh perspectives born out of genuine curiosity on the environmental mechanisms

community-led-conservation/); National Geographic editorial on Indigenous people's role in conservation (<https://www.nationalgeographic.com/environment/article/can-indigenous-land-stewardship-protect-biodiversity->).

⁵ National Science Foundation (NSF) funded award for the *Wildlife Neighbors* program (https://www.nsf.gov/awardsearch/showAward?AWD_ID=2005812).

that govern their realities subsequently serve as the foundation for groundbreaking ideas that can greatly benefit biodiversity conservation. Adolescent imagination thus provides a critical fountain of innovation, warranting full representation at the conservation decision-making table. Certainly, the fact that young children will also inherit our planet elevates their perspectives as central to these conversations, further conferring their right to these expanding discourses. Whether through art, open-ended play, or guided lesson plans, we must be open to children's perspectives as a wellspring of ideas that remind us how to honor and value biodiversity. Through open exploration and valuing the common species that call our urban systems home, younger generations of conservationists and environmental stewards can be substantial reminders of what we are collectively fighting for.

Certainly, there are other disciplines within the biological sciences alone that deserve mention. The emergence and proliferation of microbiome studies may provide us critical insight into the role small biological universes play in shaping species resilience toward global environmental change. Similarly, an in-depth investigation into ecophysiological processes may spotlight the regulatory mechanisms that are most robust to change, and those that are most directly linked to reduced health and fitness. Further still, this volume did not have a detailed explication on ecosystem ecology and nutrient cycling, broad properties that are certainly dictated by social-ecological function and socially driven urban heterogeneity. Data science and smart technologies, environmental economics, political ecology, religious studies, and philosophy will also have roles to play in this narrative. However, these integrations will be neither possible nor worthwhile if academic institutions are unwilling to grapple with the incentive structures that govern how applied, community-oriented, place-based research is valued and rewarded.

Community organizations and research institutions have fundamentally misaligned goals, which can present genuine challenges to enacting local, place-based conservation efforts. Researchers working in an academic model are often urged to prioritize peer-reviewed scientific publications as a marker of career success. These publications are

conferred extraordinary weight compared to other aspects of the profession, with activities like community engagement and diversity, equity, inclusion, and justice (DEIJ) efforts minoritized and devalued. State and federal granting agencies are further entrenched in this system: even though many of these agencies require statements explicating the broader impacts of proposed research plans, it has been notoriously difficult to quantify the true impact of proposed activities. Taken together, this results in extractive and exploitative research practices that take resources away from communities often without reciprocity. Local communities are therefore left with a written document that may detail environmental patterns relevant to their issue(s), but no mechanism nor financial backing to adjudicate those issues and find robust solutions. Ironically, academic journals often have costly paywalls that prevent access to local communities outside of academia, meaning that those individuals may not even get the opportunity to read the research conducted on their environmental issue. To effectively do urban biodiversity conservation, incentive structures within scientific research institutions must be reoriented toward effective positive community change, rather than simply being a third-party scribe disassociated from local environmental issues. Deprioritizing peer-reviewed publications and conferring greater significance to applied community-based research is thus a substantial move in the right direction.

Beyond fields of research, urban conservation inherently will rely on integrative transdisciplinarity among practitioner disciplines as well. City engineers, social workers, public works, arborists, utility companies, and countless others who play a role in managing urban landscapes and organizing people are all part of the conservation community. As communities of practice, professionals in the public sector dedicate considerable time, energy, and resources to the betterment of our neighborhoods and cities. Moreover, these public sector professionals frequently serve as the "boots on the ground," hearing directly from community members about their various environmental and societal concerns. As such, those individuals are responsible for holding the community's concerns, discussing potential implementation strategies to

address those concerns, then eventually being tasked with developing effective tools that translate to beneficial legislation for the impacted communities. Conservation action is therefore impossible without the expertise and buy-in of public sector experts.

Understanding the legal frameworks for urban conservation is also critical. For instance, agencies at different scales from local to regional, state, and national are charged with different authorities that may constrain when, where, and how conservation actions take place in cities and suburbs. However, these same authorities may also present opportunities for new conservation actions beyond traditional conservation agencies including those which focus on housing, transportation, energy, and education. Urban conservation may therefore have different legal or policy constraints and incentives than nonurban conservation. Consider the urban forest which inevitably is managed by diverse authorities: city foresters, transportation officials, parks departments, and private landowners may all have a vested interest in forest health, but utility companies may be compelled to trim or remove trees when they encroach on power lines. Consequently, natural resource agencies are likely to have little authority but will instead consult with stormwater or transportation agencies who have legal authorities to maintain and modify those components of the built environment. Making sure all entities have the time, resources, and latitude to create environmental action plans that equally value input across sectors will be critical, especially in the management of our environmental commons.

As biodiversity conservation in cities continues to transcend into mainstream discourses from academia to the public, it is our hope that these disciplines use their respective expertise to collectively innovate strategies for protecting urban biodiversity.

Back to the (just) future

It is uncertain how recognizable our environmental landscape will be 100–150 years from the present. Continued landscape conversion, development, and shifts in the global climate paint a grim picture of future cities. In obstinate

defiance of this doomsday, environmental scientists and thinkers have worked to envision alternative futures and pathways that humanity may take (34). Importantly, this envisioning exercise liberates singular-minded narratives that are restricted to contemporary systems of oppression to imagine possible future world states (34). As a result, these thought exercises facilitate modern-day time travel that activates one's ability to concurrently hold historical and contemporary processes while imagining how to make positive changes to the system. Gaining such openness, however, requires interrogating the figurative skeleton in the closet: racial capitalism.

The rise of racial capitalism saw the concept of nature transform from a shared resource owned by no one, to a commodity to be exploited and monetized (35). The commodification of nature, wilderness, and biodiversity is born out of structural processes inherent in racial capitalism, tying many conceptions of nature in the West to the institutions of slavery and land dispossession (35,36). In the US, the transition of nature to a limited, often privatized resource festered over the centuries to fuel both *de jure* and *de facto* atrocities, that serve as the foundation of our cities today. Envisioning a more just future mandates reconciliation with historical injustices, and this is especially pertinent for cities, as the geographies of neighborhoods, highways, and municipal services are birthed out of those past inequities with fear limiting progress (2).

Envisioning a future system resilient to extreme climatic events and biodiversity loss means uncovering in detail how past transgressions shape our present ecological reality (Figure 15.1). Our cities, if nothing else, are epic storytellers: the concrete, the buildings, the siting of pollutants, and even the location of trees are due to past events decades prior to our current time. All the social and ecological elements of our cities were informed by generations prior, and the cadre of recent studies typify how pervasive policies enforcing residential segregation (e.g., redlining) shape the ecology and evolution of nonhuman organisms (37–40), as well as contemporary health outcomes for people (41–43). The critical next step is creating solutions that both demonstrate critical learning from past



Figure 15.1 Sewage discharged by wastewater treatment plants, paired with prolonged heat waves and warm waters due to climate change, led to increased nutrient loads that accelerated harmful algal bloom growth in urban water bodies of the San Francisco Bay Area. The proliferation of this red tide (i.e., when accumulating algae plant colonies, often rust-colored, overpopulate an aquatic system) led to massive fish die-offs, some of which were especially pronounced in areas like Lake Merritt, Oakland, CA pictured here. Fish carcasses quickly began to accumulate on the shores of Lake Merritt and elsewhere as a result. This example further demonstrates how inextricably linked society and ecology are in cities, with negative feedbacks among these realms leading to ecosystem collapse. Radically reimagining just urban futures necessarily means deconstructing the infrastructural and municipal histories of urban landscapes to mitigate social-ecological calamities and prevent future ones from occurring. Photos courtesy of Chris Martin.

inequities and embed justice mechanisms in planning, procedure, and practice that eliminate the possibility of repeating history. This may manifest as urban land reparations for individuals with enslaved African ancestors or serious advances in Land Back discourses.⁶ Emancipatory and abolitionist movements may also need greater prominence in conservation and development processes, as a radical reimagining becomes far more likely when all peoples are free.

⁶ City of Oakland and Sogorea Te' Land Trust announce plan to return land for Indigenous stewardship (<https://www.oaklandca.gov/news/2022/sogorea-te-land-trust-and-city-of-oakland-announce-plan-to-return-land-to-indigenous-stewardship>).

Fortifying cities to become ecologically resilient to the intensification of global climate-related weather events (e.g., drought, wildfires, flooding, hurricanes) can also benefit tremendously by learning about how past inequities shape our contemporary urban ecosystems. Fortunately, urban ecologists, planners, and climate scientists have developed a breadth of knowledge on this very topic over the past decade. At its core, ecological resilience describes the overall capacity of a region, site, or habitat to flexibly adjust with disturbances that can jeopardize ecosystem balance and function (44–46). Equally well-developed have been accompanying critical discourses on who benefits most from resilience initiatives and why (47).

The formative question of who benefits and why is a recurrent theme, as the implementation of proposed solutions for building resilience, if done outside of an environmental justice and equity lens, can completely neglect or detrimentally impact the very marginalized communities that the proposed activities were intended to benefit (4). For instance, take the emergence of Nature-Based Solutions (NBS) and their growing acceptability as a prominent tool to mitigate climate change (48,49). Improving green and blue infrastructure via improved stormwater infrastructure, urban greening, and transitioning to green energy resources are offered as multifunctional solutions that (a) safeguard cities against environmental catastrophes and (b) address a variety of societal challenges like increasing access to nature (48). Because of these considerations, it is automatically assumed that NBS are socially just; however, the implementation of these solutions can exacerbate segregation, displacement, and dispossession, further widening social inequities born from historical injustices (13).

Urban greening efforts stand as one of the most prominent examples of NBS exacerbating social inequities. Tree planting efforts in low-income communities and communities of color in the US, for example, are often perceived as a net benefit because these activities increase access to nature for the most disenfranchised. Though greening efforts can subsequently increase local environmental health and aesthetics, such activities also contribute to increasing property values, taxes, and rental costs. Hence, well-meaning efforts to increase access to nature and biodiversity for the most disenfranchised consequently backfire, leading to the displacement of residents to the fringes of urban environments. This form of “green gentrification” has been studied extensively (11,47,48), emphasizing how officials in the past have weaponized climate-mitigating greening efforts against the most vulnerable communities’ needs (49). However, environmental justice and NBS do not need to be mutually exclusive. Justice principles can inform which sites are prioritized, provide a blueprint for effective implementation of proposed strategies, and require clear assessment plans that measure implementation success (49). These principles can also inform future

housing developments,⁷ tree planting efforts,⁸ and reconciliation⁹ that helps us heal from the past to build healthier cities.¹⁰ Such an effort will require a recognition of environmental injustices as an equally concerning threat to urban resilience as the climate crisis, which is inherently a political, social, and cultural task.

In building future just cities, we must accept that cities in proceeding generations will look markedly different than our past or present but are inextricably linked to both. Moreover, we cannot begin the building process without acknowledging that status quo approaches under racial capitalism are inadequate for addressing our collective global struggle. Accepting that our previously distorted relationship with nature has been destructive and counterproductive is the only viable path forward. In so doing, we can build proactive strategies that simultaneously address environmental justice and biodiversity loss concerns. As previously stated by Dr. Martha Munoz, Evolutionary Biologist and Assistant Professor at Harvard University, we must “Dismantle by building differently.”¹¹ If we genuinely want ecological resilience, it will require that we dismantle racial capitalism and its antagonistic relationship with nature.¹²

Conclusion

Urban biodiversity conservation is an emerging discipline with extraordinary promise for providing all peoples agency in conserving our natural world. We have attempted to bring together transdisciplinary expert researchers and practitioners to detail the

⁷ Pejchar and Reed’s chapter details housing development in suburban systems.

⁸ Locke et al.’s chapter discusses justice in urban greening and tree planting.

⁹ Hoover and Scarlett’s chapter addresses environmental justice and reconciliation.

¹⁰ Byers et al.’s chapter details a One Health approach and role in urban biodiversity.

¹¹ Quote from Dr. Martha Munoz, cited by Dr. Ambika Kamath (<https://ambikamath.com/>).

¹² Editorial by Vox on the relationship between capitalism and nature (<https://www.vox.com/down-to-earth/23518769/cop15-un-biodiversity-conference-montreal-biodiversity-wwf>).

state-of-the-science for urban biodiversity conservation. In doing so, we acknowledge that many disciplines and voices were invariably left out of this conversation and that urban conservation will continue to grow and expand. Accordingly, we challenge readers to constantly consider these questions so that the science and practice of urban conservation are intentional and inclusive:

- Who has the legal authority to do urban conservation where you are? What about the moral authority?
- Who is included in decision making and setting priorities for urban conservation? Who is being forgotten or left out of the decision-making process?
- Who are we calling a conservationist? Are our definitions inclusive of city engineers, transportation agencies and utilities, neighbors, and community groups?
- How are we defining biodiversity? Which species are we prioritizing and why are we doing it?

The recommendations we put forth come with a caveat: current professionals may never see the proverbial fruits of their labor. It is quite likely that our time on this plane of existence will not afford us the opportunity to experience a just future, rife with biodiverse and wildlife-friendly cities that function in equilibrium with society, rather than assume an adversarial role. Boomers, Gen X, Millennials, and perhaps even Gen Z persons are thus tasked with creating the conditions necessary for leveraging cities as hubs of biodiversity, knowing they may never reap the subsequent benefits in their lifetimes. Our responsibility is to disrupt the status quo, to spotlight the role that justice and equity play as the figurative foundation upon which we can conserve urban species. It is our task to ensure that future generations and changemakers have the tools needed to persist in a chaotic future, and to remind our progenitors that the power to innovate exists within them. The lessons from our ancestors compel us now to collectively organize and construct a blueprint for saving our natural world. This exercise alone—the act of preparation, activism, and sustainability—gives us hope.

As John Lewis, prominent civil rights activist and US representative serving for over 30 years, once

stated, “Freedom is not a state; it is an act. . . Freedom is the continuous action we all must take, and each generation must do its part to create an even more fair, more just society.” Let us hope that, if we can strive for justice every day, we can build an urban conservation practice that looks radically different once we have transcended this reality.

References

1. Soulé ME. What is conservation biology? *Bioscience*. 1985;35(11):727–34.
2. Oke C, Bekessy SA, Frantzeskaki N, Bush J, Fitzsimons JA, Garrard GE, et al. Cities should respond to the biodiversity extinction crisis. *npj Urban Sustainability*. 2021;1(1):9–12.
3. Pascual U, Adams WM, Díaz S, Lele S, Mace GM, Turnhout E. Biodiversity and the challenge of pluralism. *Nature Sustainability*. 2021;4(7):567–72.
4. Anguelovski I, Brand AL, Connolly JJT, Corbera E, Kotsila P, Steil J, et al. Expanding the boundaries of justice in urban greening scholarship: toward an emancipatory, antisubordination, intersectional, and relational approach. *Annals of the American Association of Geographers*. 2020;110(6):1743–69.
5. Mullenbach LE, Breyer B, Cutts BB, Rivers L, Larson LR. An antiracist, anticolonial agenda for urban greening and conservation. *Conservation Letters*. 2022;15(4):1–12.
6. Montambault JR, Dormer M, Campbell J, Rana N, Gottlieb S, Legge J, et al. Social equity and urban nature conservation. *Conservation Letters*. 2018;11(3):e12423.
7. Kellogg S. *Urban Ecosystem Justice: strategies for equitable sustainability and ecological literacy in the city*. Abingdon, UK: Routledge; 2021. 260 p.
8. Hoover FA, Meerow S, Grabowski ZJ, McPhearson T. Environmental justice implications of siting criteria in urban green infrastructure planning. *Journal of Environmental Policy & Planning*. 2021;23(5):665–82.
9. Langemeyer J, Connolly JJT. Weaving notions of justice into urban ecosystem services research and practice. *Environmental Science & Policy*. 2020;109:1–14.
10. Pineda-Pinto M, Frantzeskaki N, Nygaard CA. The potential of nature-based solutions to deliver ecologically just cities: lessons for research and urban planning from a systematic literature review. *Ambio*. 2022;51(1):167–82.
11. Tozer L, Hörschelmann K, Anguelovski I, Bulkeley H, Lazova Y. Whose city? Whose nature? Towards inclusive nature-based solution governance. *Cities*. 2020;107(Dec):102892.

12. Morrison TH, Adger WN, Agrawal A, Brown K, Hornsey MJ, Hughes TP, et al. Radical interventions for climate-impacted systems. *Nature Climate Change*. 2022;12(Dec):1100–6.
13. Staudinger MD, Carter SL, Cross MS, Dubois NS, Duffy JE, Enquist C, et al. Biodiversity in a changing climate: a synthesis of current and projected trends in the US. *Frontiers in Ecology and the Environment*. 2013;11(9):465–73.
14. Massarella K, Nygren A, Fletcher R, Büscher B, Kiwango WA, Komi S, et al. Transformation beyond conservation: how critical social science can contribute to a radical new agenda in biodiversity conservation. *Current Opinion in Environmental Sustainability*. 2021;49:79–87.
15. Lysaght T, Capps B, Bailey M, Bickford D, Coker R, Lederman Z, et al. Justice is the missing link in One Health: results of a mixed methods study in an urban city state. *PLoS One*. 2017;12(1):e0170967.
16. Puppim de Oliveira JA, Balaban O, Doll CNH, Moreno-Peñaranda R, Gasparatos A, Iossifova D, et al. Cities and biodiversity: perspectives and governance challenges for implementing the convention on biological diversity (CBD) at the city level. *Biological Conservation*. 2011;144(5):1302–13.
17. Swan CM, Pickett STA, Szlavecz K, Warren P, Willey KT. Biodiversity and community composition in urban ecosystems: coupled human, spatial, and metacommunity processes. In: Niemelä J (ed.) *Urban Ecology: patterns, processes, and applications*. Oxford: Oxford University Press; 2013. p. 179–86.
18. Uchida K, Blakey RV, Burger JR, Cooper DS, Niesner CA, Blumstein DT. Urban biodiversity and the importance of scale. *Trends in Ecology & Evolution*. 2021;36(2):123–31.
19. Agrawal A, Redford K. Conservation and displacement: an overview. *Conservation and Society*. 2009;7(1):1.
20. Woelfle-Erskine CA. *Underflows: queer trans ecologies and river justice*. Seattle, WA: University of Washington Press; 2022.
21. Goddard MA, Dougill AJ, Benton TG. Scaling up from gardens: biodiversity conservation in urban environments. *Trends in Ecology & Evolution*. 2010;25(2): 90–8.
22. Aronson MFJ, Lepczyk CA, Evans KL, Goddard MA, Lerman SB, MacIvor JS, et al. Biodiversity in the city: key challenges for urban green space management. *Frontiers in Ecology and the Environment*. 2017;15(4):189–96.
23. Schell CJ, Guy C, Shelton DS, Campbell-Staton SC, Sealey BA, Lee DN, et al. Recreating Wakanda by promoting Black excellence in ecology and evolution. *Nature Ecology and Evolution*. 2020;4(10): 1285–7.
24. Reese G, Jacob L. Principles of environmental justice and pro-environmental action: a two-step process model of moral anger and responsibility to act. *Environmental Science and Policy*. 2015;51:88–94.
25. Fletcher M-S, Hamilton R, Dressler W, Palmer L. Indigenous knowledge and the shackles of wilderness. *Proceedings of the National Academy of Sciences of the U. S. A.* 2021;118(40):e2022218118.
26. Hernandez, V. Indigenizing restoration: Indigenous lands before urban parks. *Human Biology*. 2020;92(1):37–44.
27. Krasny ME, Lundholm C, Shava S, Lee E, Kobori H. Urban landscapes as learning arenas for biodiversity and ecosystem services management. In: Elmqvist E, Fragkias M, Goodness J, Güneralp B, Marcotullio PJ, McDonald RI, et al. (eds.) *Urbanization, Biodiversity and Ecosystem Services: challenges and opportunities*. Dordrecht: Springer Netherlands; 2013. p. 629–64.
28. Muvengwi J, Kwenda A, Mbiba M, Mpindu T. The role of urban schools in biodiversity conservation across an urban landscape. *Urban Forest & Urban Greening*. 2019;43(Jul):126370.
29. Hunter MR, Gillespie BW, Chen SY-P. Urban nature experiences reduce stress in the context of daily life based on salivary biomarkers. *Frontiers in Psychology*. 2019;10:722.
30. Corraliza JA, Collado S, Bethelmy L. Nature as a moderator of stress in urban children. *Procedia Social and Behavioral Sciences*. 2012;38:253–63.
31. Moore ML, Milkoreit M. Imagination and transformations to sustainable and just futures. *Elementa*. 2020;8(1):1–17.
32. Desmond M. Capitalism. In: Roper C, Silverman I, Silverstein J (eds.) *The 1619 Project: a new origin story*. London: One World; 2021. p. 165–85.
33. Taylor DE. *The Rise of the American Conservation Movement: power, privilege, and environmental protection*. Durham, NC: Duke University Press Books; 2016. 496 p.
34. Schmidt C, Garroway CJ. Systemic racism alters wildlife genetic diversity. *Proceedings of the National Academy of Sciences of the U. S. A.* 2022;119(43):e2102860119.
35. Schell CJ, Dyson K, Fuentes TL, Des Roches S, Harris NC, Miller DS, et al. The ecological and evolutionary consequences of systemic racism in urban environments. *Science* (80-). 2020;369(6510):eaay4497.
36. Locke DH, Hall B, Grove JM, Pickett STA, Ogden LA, Aoki C, et al. Residential housing segregation and

- urban tree canopy in 37 US cities. *npj Urban Sustainability*. 2021;1(1):15.
37. Grove M, Ogden L, Pickett S, Boone C, Buckley G, Locke DH, et al. The legacy effect: understanding how segregation and environmental injustice unfold over time in Baltimore. *Annals of the American Association of Geographers*. 2018;108(2):524–37.
 38. Nardone AL, Casey JA, Rudolph KE, Karasek D, Mujahid M, Morello-Frosch R. Associations between historical redlining and birth outcomes from 2006 through 2015 in California. *PLoS One*. 2020;15(8):e0237241.
 39. Lane HM, Morello-Frosch R, Marshall JD, Apte JS. Historical redlining is associated with present-day air pollution disparities in U.S. cities. *Environmental Science & Technology Letters*. 2022;9(4):345–50.
 40. Nardone A, Casey JA, Morello-Frosch R, Mujahid M, Balmes JR, Thakur N. Associations between historical residential redlining and current age-adjusted rates of emergency department visits due to asthma across eight cities in California: an ecological study. *Lancet Planetary Health*. 2020;4(1):e24–31.
 41. Childers DL, Cadenasso ML, Morgan Grove J, Marshall V, McGrath B, Pickett STA. An ecology for cities: a transformational nexus of design and ecology to advance climate change resilience and urban sustainability. *Sustainability*. 2015;7(4):3774–91.
 42. Pickett STA, McGrath B, Cadenasso ML, Felson AJ. Ecological resilience and resilient cities. *Building Research & Information*. 2014;42(2):143–57.
 43. Meerow S, Newell JP, Stults M. Defining urban resilience: a review. *Landscape and Urban Planning*. 2016;147:38–49.
 44. Vale LJ. The politics of resilient cities: whose resilience and whose city? *Building Research and Information*. 2014;42(2):191–201.
 45. Seddon N, Chausson A, Berry P, Girardin CAJ, Smith A, Turner B. Understanding the value and limits of nature-based solutions to climate change and other global challenges. *Philosophical Transactions of Royal Society B Biol. Sci.* 2020;375(1794):20190120.
 46. Hobbie SE, Grimm NB. Nature-based approaches to managing climate change impacts in cities. *Philosophical Transactions of Royal Society B Biol. Sci.* 2020;375(1794):20190124.
 47. Anguelovski I. From toxic sites to parks as (green) LULUs? New challenges of inequity, privilege, gentrification, and exclusion for urban environmental justice. *Journal of Planning Literature*. 2016;31(1):23–36.
 48. Wolch JR, Byrne J, Newell JP. Urban green space, public health, and environmental justice: the challenge of making cities “just green enough.” *Landscape and Urban Planning*. 2014;125:234–44.
 49. Anguelovski I, Corbera E. Integrating justice in Nature-Based Solutions to avoid nature-enabled disempowerment. *Ambio*. 2022;52(1):45–53.