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More Than We Can Return: Rethinking Reciprocity with a Nature That Heals Us

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Abstract

Nature-based interventions (NBI) and Green Prescriptions (GRx) have renewed interest in the relationship between human well-being and ecosystems, yet their implementation often risks reproducing the utilitarian logic underlying environmental degradation. Reciprocity between humans and Nature is increasingly invoked as a promising principle for restoring individual and Planetary Health. However, while appealing, this framework risks falling into a transactional model rooted in symmetry and apparent equivalence, obscuring the complexity and nonlinear dynamics of ecosystem functioning. This work explores reciprocity within Nature-based health interventions and ecosystem services, revealing paradoxes and limitations and arguing for a shift from transactional reciprocity toward interconnectedness and relational interbeing. Such awareness is crucial when humans interact with ecosystems to benefit from their restorativeness and therapeutic potential. We discuss how high-biodiversity and ecologically vulnerable environments derive therapeutic potential from their rarity and sensitivity, making unrestricted access for tourism, recreation, or health practices ecologically untenable. We propose that NBI and GRx must integrate, alongside clinical protocols, considerations of ecosystem health, carrying capacity, nonhuman life needs, and cumulative pressures arising when therapeutic use overlaps with other human presence. Biocultural perspectives further emphasize relational embeddedness and kinship obligations, aligning with One Health and Planetary Health principles that view human well-being as inseparable from ecosystem vitality. We propose that genuine care for Nature may not require "doing more" or "faster," but doing less and more slowly: exercising self-restraint, reducing pressure on ecosystems, renouncing control, and tempering the human ego to prioritize Nature's evolved processes over active interventions. Ethical and operational implications include reframing conservation and ecological management around self-limitation, intergenerational justice, and recognition of nonhuman agency, fostering coexistence over compensation.
Key Words: Ecological perspectives–Green Prescriptions–Nature-based interventions–Interconnectedness–Human–Nature reciprocity

Introduction

Every individual on planet Earth, regardless of the species, interacts with the surrounding environment and tends to modify it to increase the chances to survive. The human species has similarly flourished through its mastery in using tools and modifying the environmental structure (Boivin et al., 2016). However, a key difference between humans and other species is represented by the power, in the physical sense of *work over time*, that human action had, and still is having, in short amounts of time (Dodman et al., 2025); in contrast, is characterized by the high intensity, intended as function of *power over area*, of the anthropogenic impacts (Ellis et al., 2021; Steffen et al., 2007; Waters et al., 2016). Such transformations have historically ranged from forms of sustainable management and stewardship, as practiced for centuries by many Indigenous Peoples and local communities, to extractive and degrading uses. As humans, we are able to transform, exploit, and degrade ecosystems much faster and with much higher intensity than can be regenerated by the living,

dynamic web of more-than-human relationships, ecological processes, and environments in which humans are embedded, that goes under the name of "Nature" (which, according to Berto and Barbiero, 2017, in this article is written with a capital "N" to indicate the biosphere and the abiotic matrices such as soil, air, water where it flourishes, also to avoid confusion with "nature" as the intrinsic quality of a certain creature and/or phenomenon).

The worldviews of some socioeconomic systems (Carlisle and Salvador, 2021) have progressively developed a dualistic perspective between natural environment and anthropic environment, especially in industrialized Western societies—intended as societies characterized by cultural and socioeconomic systems shaped by industrialization, dualistic ontologies, and extractive developmental logics that have become influential on a large scale. Within these perspectives, there is the illusory idea that the human species is allowed to consider itself beyond the rules that govern ecological processes, and this dichotomy leveraged a profound disconnection between many industrialized societies and the ecological systems on which they depend, resulting in ecosystem destruction and biodiversity loss, which have exacerbated since the Industrial era (Ellis et al., 2021). The consequences of such disconnection and ecological imbalances are not only environmental but also existential (Beery et al., 2023), contributing to growing experiences of what has been termed "ecological grief" (Malavasi, 2025), that is, an emotional and embodied response to environmental loss and degradation. This grief often emerges among those who feel a deep relational bond with ecosystems and living beings and who therefore experience significant distress when inhabiting social–cultural systems that do not reflect or honor such connectedness (Cunsolo and Ellis, 2018).

Modern societies have recently started to recognize the value of ecosystem services and Nature's contributions to people (Daily, 1997), defined as the ecological processes, functions, and relational benefits through which ecosystems support human well-being, including material, cultural, spiritual, and psychological dimensions (IPBES, 2019; Pascual et al., 2023). However, this recognition often remains confined within ideological or instrumental frameworks that struggle to be actually implemented into effective policymaking. The recent Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) Transformative Change Assessment (IPBES, 2024) highlights that overcoming this gap requires profound sociocultural shifts, including the abandonment of extractive logics and the adoption of relational, nondualistic ways of engaging with ecosystems. This means also to raise awareness on the fact that, despite the concept of ecosystem services suggested a perspective for achieving ecosystem-based management, the framing of Nature as "natural capital" has posed the increasing risk of reinforcing a utilitarian worldview in which humans are allowed to engage with ecosystems through the logic of management and monetary value, rather than through valuing embeddedness and codependence.

Nevertheless, research highlights that the benefits and the services that ecosystems offer to human individuals extend well beyond material goods. A large body of work shows that Nature sustains relational bonds and social connectedness (Peters et al., 2010; Weinstein et al., 2015), nurtures spiritual meaning-making and practices (Barlow, 1997; Christie, 2013), and provides cultural identity and heritage values (Cabana et al., 2024; Milcu et al., 2013). Notably, ecosystems also play a key role for psychological and emotional well-being that are essential to human health (Subiza-Pérez et al., 2020; Summers and Vivian, 2018). It fosters a sense of embeddedness and personal meaning within larger ecological and cultural networks, and enables cognitive restoration (Barbiero and Berto, 2018; Kaplan, 1995), stress alleviation (Ulrich et al., 1991), and attentional fatigue relief (Berto et al., 2010). Along with the so far established literature that makes evident the importance of cultural ecosystem services and recreational potential of the natural environment, a growing body of evidence also reveals how contact with the natural environment regulates human cognitive functioning (Bratman et al., 2015; Berman et al., 2008), and how ecosystem structure influences human health (Gillerot et al., 2025; Stocco et al., 2025).

This recognition has led to the emergence of Nature-based interventions (NBI), a wide set of activities that promote well-being and disease prevention through contact with natural and seminatural environmental settings (Djernis et al., 2019; Struthers et al., 2024). While NBI are typically framed within health and therapeutic paradigms, their effectiveness ultimately depends on underlying ecological processes, which support psychological restoration, stress reduction, and physiological recovery, up to the point that they can be considered specific types of ecosystem services (Bratman et al., 2019). Among the NBI, Green Prescriptions (GRx) are an emerging clinical practice in which health care practitioners prescribe specific activities, including those performed in contact with Nature, as part of preventive or therapeutic care intervention. Although their implementation is still far from standardized (Stanhope and Weinstein, 2023), GRx represent a tool available to healthcare practitioners that, on the basis of a diagnosis of illness or risk for

pathological conditions, invite individuals to interact with Nature as a therapeutic strategy, often aiming to reduce pharmaceutical use and enhance recovery (Piras et al., 2025; Robinson and Breed, 2019). The rising popularity of GRx, NBI, and the effective recreational role of ecosystems has the potential to catalyze a deep cultural shift, in which society better understands the irreplaceable role of Nature (Bell et al., 2023). Yet, these trends risk perpetuating a familiar and unsustainable pattern, particularly prevalent in industrialized and growth-oriented societies, in which humans seek to take from Nature even in the act of healing from the very conditions those socio-economic systems have themselves produced.

As ecologists trained and currently situated within the European environmental sciences context, we raise the concern that Nature-based health practices can, if uncritically implemented, mirror the same utilitarian logics they aim to move beyond, potentially reinforcing subtle forms of extraction rather than fostering relational reciprocity. By recognizing our situatedness and the limitations inherent to our standpoint, we acknowledge that this dynamic is historically rooted in Western industrialized worldviews that have globalized over time, and whose influence now extends across diverse societies, shaping relations far beyond their original cultural and geopolitical context.

Increased human presence in restorative environments, though devoted to recreational as well as therapeutic purposes, does contribute to ecological degradation and triggers a vicious cycle that "exploits" Nature's services and could impact the structure and functioning of the ecosystems, compromising also their therapeutic value (Stocco et al., 2025). In fact, as happens with landscapes that gain visibility and popularity through social media (Alonso-Almeida et al., 2019; Arts et al., 2021), the demand for healing environments driven by growing evidence of therapeutic effectiveness and NBI mainstreaming can intensify anthropogenic pressure, undermining ecosystem integrity and, in the long term, limiting benefits for those most in need.

Moreover, NBI and clinical application of GRx build upon, and nowadays go far beyond, the early foundational evidence such as Ulrich's (1984) seminal postoperative recovery study, in which patients with a view of trees experienced fewer complications and shorter hospital stays compared with those facing a brick wall, and the early physiological research on experiencing the soundscape of forests (Tsunetsugu et al., 2007).

Today, NBI increasingly include immersive experiences like forest bathing, wilderness therapy (Corazon et al., 2018; Sahlin and Palsdottir, 2011), therapeutic gardening (Harris, 2017; Horowitz, 2012), and so-called "green care programs," which often involve active interventions on the surrounding environment, such as seeding, tree planting, and path maintenance.

As these practices gain popularity, some practitioners have also called for a conceptual expansion of how we relate to Nature, which heals us, with the aim of preventing an opportunistic view of Nature as a simple "health care service provider." This includes the idea of reciprocity: that the health benefits we receive from Nature might encourage us to give something back, nurturing a regenerative, respectful relationship with the more-than-human world. In this view, renewed connectedness with ecosystems would translate into cultivating planetary stewardship and pro-environmental behavior (Albrecht et al., 2024; Berto and Barbiero, 2017; Victorson, 2024), as well as engaging in activities that aim at "doing something positive" (Husk et al., 2016; O'Brien et al., 2010), restoring nature in the attempt of restoring the self (Barton and Pretty, 2010; Mellor et al., 2022; Patrick et al., 2022; Shanahan et al., 2019). As highlighted by Danon (2019), indeed, embracing an ecopsychological perspective contributes to develop an active and attentive attitude to one's own impact on the world and to promote a process of personal growth. Under this perspective, ecopsychology contributes to a process of personal development that goes "from ego to eco," in which psychological well-being becomes inseparable from the well-being of the wider ecological community. This transition involves expanding one's sense of identity, moving from an individualistic and anthropocentric orientation toward a relational self that acknowledges interdependence, responsibility, and the need to minimize harm.

Proposals within sustainability science echo this idea, calling for a shift from extractivism to relational and regenerative paradigms. Concepts such as "services to ecosystems" (Comberti et al., 2015) and "co-production of Nature's Contributions to People" (Díaz and Pascual, 2025) aim to reverse the unidirectional flow of benefits and emphasize the concept of mutual care.

Nevertheless, even these well-intentioned strategies risk perpetuating a utilitarian logic, where Nature is approached primarily as the passive object to which we need to reconnect, and thus we need to modify or "enrich" according to our conceptual understanding of its structure, processes, and our aesthetic preferences. Quite paradoxically, the willingness to perform some concrete actions, often requiring modification of soil, plant community, and animal manipulation, is frequently driven by a perceived need to "give back" to Nature. Yet these efforts rest on the anthropocentric assumption that we really can know what is good for the ecosystem or how to restore ecological processes. This raises questions about reciprocity,

responsibility, and how societies shaped by extractive logics might move beyond compensation and enhancement toward practices grounded in restraint, relationality, and belonging.

Therefore, the discourse around reciprocity raises critical questions: can humans truly reciprocate what ecosystems provide? Do our actions reflect relational care, or are they extensions of anthropocentric control? And if Nature can heal us, what should we do in return? Addressing these questions requires reexamining prevailing human–Nature paradigms and may ultimately set the foundation for a new relational ethic.

Reciprocity: From Promises to Limits

So far, different descriptions of reciprocity between human and Nature have been proposed. However, definitions of reciprocity vary and are shaped by different conceptual and cultural backgrounds (Vaccaro, 2024). As the idea of "giving back" to Nature becomes more common, especially among health care practitioners, psychologists, and ecopsychologists, it becomes increasingly important to clearly frame what reciprocity means and whether it can actually be a reasonable concept, also under the ecological perspective.

Some authors proposed to consider reciprocity as a form of mutual care and respect between human and nonhuman beings (Descola et al., 2013; Himes et al., 2024; Marihuan and Rapimán, 2019; Pierotti and Wildcat, 2000). In this view, "doing the right thing" helps mutual flourishing, aligning with relational values (Chan et al., 2016; Pascual et al., 2023).

Other scholars highlighted the occurrence of feedback mechanisms that connect living beings in a relational network of mutual interactions (Phatthanaphraiwan and Greene, 2023). Such a relational network also includes gratitude, based on the awareness that gifts return in a cycle and that positive and well-intended interactions, at least between human and wildlife, lay the basis for reciprocal benefits (van der Wal et al., 2022).

Deepening this framework, Vaccaro (2024) introduces the differentiation between intentional and nonintentional interactions, emphasizing the key role of the systemic properties in shaping human-Nature interactions. This allows for the differentiation of systems of thought based on how they conceptualize the occurrence of human-Nature relationships, distinguishing between approaches that acknowledge the presence of agency and a role in all beings, and those that focus on systemic and emergent feedback loops in the absence of intentionality.

In light of this, Fromentin et al. (2023) and Díaz and Pascual (2025) suggested a broad definition of reciprocity, encompassing mutual effects, both positive or negative, occurring between autonomous living entities, with emphasis on the systemic drivers.

In contrast, some scholars propose that reciprocity must be seen as a moral duty, similar to a social norm or an ethical obligation, rather than a transaction (Armstrong et al., 2025), likely grounded in intergenerational knowledge (Correia et al., 2025).

This perspective of moral and spiritual duty is also the common ground shared by various religions that frame reciprocity as spiritual and ethical responsibility toward the environment. Nature is ultimately seen as a gift, not as a property (Al-Faruqi, 1994; James, 2003; Pope Francis, 2015; Sponsel & Natadecha-Sponsel, 2003), and we need to act with responsibility not only to take but also to try to give back, especially to repair damage that has occurred.

Limitations and Issues in Symmetrical Reciprocity

While recognizing the depth of the insightful concepts related to human–Nature reciprocity, they are all based on the application of human ethics to ecosystems, gifted with different ethics. Moreover, the idea also raises conceptual and practical issues. In the first place, some interpretations of reciprocity, especially those grounded in transactional or compensatory logic, implicitly assume a dualistic separation between a human subject and a Nature object to which something must be "given back". This dualism contrasts with relational–ecological and Indigenous perspectives, in which reciprocity is understood as co-presence, mutual influence, or ongoing feedback rather than balanced exchange, and risks reinforcing the very separation that ecopsychology and Planetary Health paradigms aim to dissolve. Secondly, the concept of reciprocity may inadvertently replicate a ledger-based logic: the belief that we can restore balance by offsetting what we've taken, for instance, by planting trees in a field to compensate for emissions occurring elsewhere, or engaging in local restoration projects to pay back Nature for our impacts. The issue is that the notion of reciprocity, as commonly interpreted within Western economic and social theory as a balanced, transactional exchange (Gouldner, 1960; Ingold, 2021; Vaccaro, 2024), often relies on a misleading assumption of symmetry: the belief that what is taken from Nature can be adequately compensated, restored, or returned. This assumption overlooks a profound ecological disproportionality and fails to understand a fundamental asymmetry: what a complex ecological system gives us, especially in the context of health and psychological restoration, far exceeds what we can really return to the system itself (Díaz et al., 2018; Odum, 1983).

Whether in the form of food, shelter, psychological well-being, or relief from chronic pain, the benefits provided by Nature involve the work of complex ecological processes that have evolved over geological eras. Metaphorically, as a fisher take not only fish biomass, but also the energy that has been invested by ecological processes through complex interactions in trophic webs (Campbell et al., 2015; Odum, 1983), achieved over a long time and within a large spatial scale, a patient experiencing a forest walk, prescribed through a GRx, is not just receiving the outcomes of simple, real-time processes, achieved by an intentional agent, that can possibly be replaced if damaged or removed. As a consequence, the therapeutic value that the patient receive, in form of reduced stress or enhanced immune functions, among the others, is not only the result of mere presence of trees, or the beneficial molecules they produce (Lew and Fleming, 2024): it stems from a multi-layered ecological structure, with a dense network of interdependent life forms, including invisible microbial communities and subtle cues that humans can barely perceive. Any attempt of "giving back" through the decision of planting a tree, or some flowering plants, or participating in a local restoration effort, is ethically commendable, but ecologically incommensurate with the depth and scale of what has been received. Thus, acts of "giving back" to the ecosystem, however symbolically meaningful under the personal point of view of the patient itself, may be functionally insufficient.

Even worse is that actions of "performative reciprocity" might be even ecologically misguided. For instance, planting a certain species of trees along a path used for forest therapy might restore some visual greenery or increase the concentration of beneficial Volatile Organic Compounds (Antonelli et al., 2020), but ignore the underlying ecological functions or the needs of nonhuman species. As reported for some cases of ecological restoration interventions that were guided more by human aesthetics preferences than by ecological relevance, thus privileging charismatic species or visually appealing landscapes (Adamo et al., 2022; Prior and Brady, 2017), a similar bias may arise if habitat restoration or conservation efforts are shaped by human expectations on what an ecosystem should deliver in terms of specific outputs or services. While such an approach may be acceptable or even necessary in highly modified ecosystems that are managed by humans (Stocco and Pranovi, 2023), it might become problematic in the context of ecosystems attended as settings for NBI, where positive outcomes for humans may rely on subtle and complex ecological balances that we barely started to study, and that we neither fully understand, perceive, nor control. If reciprocity and the perception of what really counts as Nature follow aesthetic or therapeutic preferences, an active intervention risks shaping ecosystem design and development according to human-centered needs for health and well-being, but potentially flattening ecological integrity even while claiming to care for it.

Furthermore, other compensatory actions implemented on a wider spatial scale, like offsetting emissions through reforestation or wetland maintenance far from the site of impact, may lack ecological specificity. Local ecosystems are indeed complex systems, with emergent properties, nonlinear dynamics, and specific goal functions (Nielsen and Jorgensen, 2013). These characteristics mean that ecological responses are not always proportional to human actions, and interventions in one place cannot simply offset impacts occurring elsewhere (Bateman et al., 2023). As complex systems science has shown, the nonlinearity, the presence of thresholds, and the contextual dependency of ecological systems (Strogatz, 2024) make equivalent exchange an illusion, reinforcing the idea that a simple compensatory logic is unable to address multiple-scale effects. Under this perspective, for example, carbon offsetting may mitigate global greenhouse gases, but fails to restore the ecological structure and function of a degraded site.

The asymmetry that emerges is not merely ecological; it also has psychological consequences. On the one hand, people may experience the belief that effort in some areas of their daily life, like differentiating waste, being engaged in activism, or environmental volunteering, is enough to discharge one's ethical responsibility. On the other hand, more vulnerable people might experience distrust and paralysis by inadequacy, either due to direct unsuccessful restoration experiences (Jellinek et al., 2020) or from the belief that no action of a single person is sufficient in a natural world overwhelmed by serious and widespread anthropogenic pressures. This can lead to eco-anxiety, discouragement, or moral fatigue (Clayton, 2020; Hickman et al., 2021). Both extremes, therefore, undermine genuine relational engagement with both the Nature where we live, and the society we interact with.

These realizations should not invalidate the impulse to reciprocate and to take care of Nature, but they challenge us to reframe the idea of human-Nature reciprocity. Rather than asking what we can give back, we might ask what kinds of restraint and ethical commitment are appropriate for the ecosystems we live within. Especially within the context of NBI and GRx, human–Nature reciprocity must not be reduced to a transaction, but understood as an asymmetrical responsibility, grounded in reverence, deeper humility, system-thinking, and belonging.

Of course, embracing such a relational view of human–Nature reciprocity also entails significant socioeconomic challenges. Reducing human pressure, limiting access to sensitive ecosystems, or prioritizing ecological integrity over short-term human use can conflict with economic interests rooted in tourism (Li et al., 2024), real estate (Anguelovski et al., 2022), and other management strategies based on the maximization of a few ecosystem services (Stocco et al., 2024). In many regions, livelihoods depend on activities that increase visitation or extractive use, creating structural barriers to implementing restraint-based ethical frameworks. Moreover, unequal access to green space means that restrictions aimed at protecting ecosystem integrity may disproportionately affect vulnerable groups, unless accompanied by policies ensuring environmental justice and alternative Nature access. These tensions illustrate that relational ethics cannot be applied in isolation: their real-world impact depends on governance structures, funding mechanisms, and socioeconomic systems that currently incentivize use rather than restraint.

Reframing Reciprocity: From "Humans and Nature" to "Nature to Which Humans Belong"

In many place-based Indigenous[a], biocultural, and religious ontologies, the asymmetry between humans and Nature is not a problem to solve, but a truth to embrace as a starting point for achieving a peaceful sense of belonging, an opportunity to be part of something bigger than us.

According to these perspectives, humans are not separate from Nature, but coinhabitants within complex, evolving systems. Reciprocity, therefore, is not a symmetrical exchange and is even difficult to consider, since the right way to live is based on coexistence, grounded in respect, reverence, and a sense of kinship with the more-than-human world (Hoyte and Mangombe, 2025).

In this view, the benefits gained from ecosystems, whether physical, emotional, or spiritual, rather than necessitating an equivalent return which must deviate from the daily norm, require being grounded in a deep, ongoing connection with Nature, one that helps humans take only what is necessary, recognizing themselves as part of the ecosystems' functions and cycles.

Examples of place-based relational ontologies further clarify how reciprocity is understood as an ongoing practice rather than a symmetrical exchange. Among the Pewenche of southern Chile, the collection of seeds from the sacred Pewen tree (*Araucaria araucana*) involves asking permission from the natural strengths that inhabit the forest, thus reinforcing responsibility, restraint, and territorial care (Ojeda et al., 2022). In the seascapes of Chilean Patagonia, traditional *corrales de pesca* (rock-built fishponds) exemplify reciprocal contributions between people and biodiversity: these structures provide fish for local communities while enhancing mollusk abundance and supporting fish-eating birds (Ojeda et al., 2024). A similar relational ethos appears in Potawatomi traditions, where ethical responsibility is cultivated through gratitude, care, and continuous awareness rather than through compensatory actions aimed at restoring balance (Kimmerer, 2020). Other Indigenous-led and Indigenous-centered research further enriches relational understandings of reciprocity. Recent work by Fisk et al. (2025) shows how reciprocal relations in Indigenous contexts are enacted through obligations of care, accountability, and interdependence that extend across human and more-than-human kin. Similarly, a growing body of literature on Indigenous healing practices highlights how well-being emerges from relational balance within networks of land, ancestors, plants, animals, and community (Yu et al., 2020). Additionally, works on Indigenous perspectives across the Americas highlight the perspective of "Niw_hk_m_kanak"—All My/Our Relations (Chartrand, 2007), which frames humans as embedded within living and nonliving systems and bound by land-based responsibilities, rather than as external agents.

Acknowledging these perspectives, the primary ethical task for a human should therefore be grounded not in the idea of extracting first, and then restoring balance through specific, time-bound compensatory action, but in consistently maintaining the most balanced relationship through attentiveness, nonintrusion, and reciprocal awareness; in other words, reciprocity is better framed as coexistence rather than equivalence. This framework reminds the concept of "obligate ecological relationships," for which a continuous exchange between humans and ecosystems can be seen as a form of mutualism and parasitism, based on codependence and coevolution (Miltenburg et al., 2022). In this light, the healing potential of ecosystems is not simply a service, but the emergent expression of relational integrity, forged over time through deep interactions and a shared evolutionary history among species (de Castro, 2007).

Relational worldviews also expand the temporal horizon of human–Nature interconnectedness in both the short and the long

[a]Here, we use the term "Indigenous perspectives" to indicate relational ontologies grounded in place-based knowledge systems, without implying homogeneity across cultures.

term. Rather than being confined to the present, the responsibility for an ecosystem is understood as unfolding across a person's entire life, from childhood to old age, and as extending across generations (Fernández-Llamazares and Virtanen, 2020; Fowler and Lepofsky, 2011; Nadasdy, 2007). In many cultures, humans are called to act not only in response to past gifts that have already received but also in anticipation of those yet to come or those that they might be in need of along their life as individuals. This temporal reciprocity deepens the ethical grounding of NBI and GRx, highlighting the responsibility to preserve restorative ecosystems not only for future generations but also for oneself over time. A person who does not require care today may depend on Nature later in life, just as their elders may already do and their descendants likely will. Ensuring ecological viability thus becomes an act of intergenerational and intragenerational care, rooted in systemic interconnectedness rather than in occasional or ad hoc gestures, aimed at discharging a perceived duty to reciprocate (Buddy, 2014).

Finally, such a sense of kinship and intergenerational legacy, described in Indigenous knowledge systems (Teixidor-Toneu et al., 2025), finds resonance in the scientific foundations of ecology, which views ecosystems as interconnected webs of life. From an ecological perspective, humans are merely one species among many that have inhabited Earth over billions of years. All the species depend on one another, on natural resources, and on ecological processes, which we now refer to as ecosystem services. However, no species other than humans questions reciprocity or seeks to be reciprocated, because their participation in the ecosystem is inherent rather than conditional: their well-being and population equilibrium contribute naturally to ecosystem functioning. In this sense, they are bound to the system, sharing its fate and sustaining it through their presence and interaction (Berkes, 2012).

This is the reason why many Indigenous, traditional, and local ecological knowledge systems operationalize their holistic view of reciprocity and interconnectedness not by doing more but by doing less and by avoiding to take more than necessary. In this way, the asymmetry between the individual part of the ecosystem and the ecosystem itself is acknowledged, recognizing that the whole ecosystem is continuously evolving, also through the shifts and dynamical oscillations produced by each of its components. The emphasis is therefore on avoiding harm and excessive disturbance to the balance: refraining from harmful action is often seen as the first and most essential form of reciprocity and at the same time of self-care, since it allows for flourishing without interference. Interestingly, these perspectives align with certain insights from neurodivergent people's experiences, where individuals often report a felt sense of connection to Nature that is not conceptual but embodied and intuitive (Friedman et al., 2025). Neurodiverse individuals may naturally resist anthropocentric framing and experience ecosystems as living communities, not backdrops (Varela et al., 2021). This suggests that some cultural tendencies to dominate or fix Nature are not universal, but socially constructed, and that alternative ways of perceiving and relating are not only possible but already present within our societies. Such a shift also echoes the recent IPBES calls for transformative pathways that move beyond instrumental management and toward reciprocal, relational engagements with the more-than-human world (IPBES, 2024).

In the framework of Planetary Health (Zelenski et al., 2023), these perspectives call us to shift from "restoring Nature" to rejoining it and to recognize that we are not separate observers, but participants in co-evolving ecological systems. Rather than asking how we can heal the Earth, we might ask how we can allow Earth to continue healing us by stepping back, listening, and limiting the impulses of intervention and control.

Operational and Ethical Implications

Since ecosystems offer therapeutic benefits, the way we engage with these environments for healing purposes must be reconsidered in both ethical and practical terms. Interventions within NBI and GRx protocols are indeed not neutral: they are intrinsically embedded within cultural, ecological, and infrastructural systems that have real impacts on both people and places.

The first ethical implication is that Nature cannot become just another clinical resource, akin to a sort of outdoor pharmacy from which we extract benefits without consequence. While NBI offer legitimate health benefits, their design and implementation must account for the ecological pressures they might generate. Increased foot traffic, noise, habitat fragmentation, and infrastructure development associated with NBI and GRx can indeed compromise the very ecological conditions that make these environments restorative (Padma et al., 2022; Shang et al., 2025). Moreover, the ecological, structural, and aesthetic qualities that make certain environments restorative also make them highly attractive for tourism and recreation, resulting in concentrated human presence and amplified cumulative pressures. As a result, if the same ecosystem already sustains overlapping recreational, touristic, and therapeutic uses, the pressures associated with these activities reinforce each other,

especially when NBI and GRx generate similar attendance patterns or intensify existing visitation flows.

Nor the possible active and performative interventions made in the attempt to reciprocate the favor by acting on the same or other natural ecosystems can repair the impact that occurred to a therapeutic ecosystem. Thus, a relational ethic of restraint is urgently needed. True reciprocity in the context of GRx and NBI should not imply adding more interventions or activities into natural settings but often the opposite: reducing use, limiting intrusion, and preventing or minimizing impact. This includes both individual practices, namely pro-environmental behaviors and attitudes in the perspective of ecological sufficiency, understood as the ethical commitment to reducing consumption to curb one's material footprint (Jungell-Michelsson and Heikkurinen, 2022).

For health care providers, this means that prescribers and GRx program designers must ask not only what is good for the patient, but also what is sustainable for the ecosystem, especially in the case of high-use or sensitive environments that have the role of co-healer. Conversely, natural area managers should evaluate which sites might be temporarily prioritized for those with high therapeutic needs, while restricting high-impact recreational activities, namely, those that impose disproportionate ecological pressure (e.g., speed, noise, off-trail movement, soil compaction, vegetation trampling, potential wildlife disturbance) and exceed the regenerative capacity of sensitive or species-rich environments.

Given that health care professionals usually have limited ecological training and, in contrast, natural area managers rarely have clinical expertise, addressing this challenge requires structured interdisciplinary dialogue. Codesigned GRx pathways involving ecologists, environmental scientists, health care providers, and natural area managers can help identify sites where therapeutic access is ecologically viable and determine appropriate modalities, frequencies, and seasons of use. Such interdisciplinary collaboration reflects a holistic perspective akin to One Health and Planetary Health frameworks (de Castañeda et al., 2023; Salerno et al., 2025), ensuring that patient needs and ecosystem integrity are jointly considered.

This leads to a second general implication: although the experience of natural beauty is a universal human right, unrestricted access to natural areas and wilder ecosystems is not. High-biodiversity ecosystems, characterized by rare species, structural complexity, and sensitive ecological dynamics, hold their therapeutic and aesthetic power precisely because they are uncommon and irreplaceable. Their capacity to sustain human presence is limited, and the justice owed to ecosystems themselves requires that access be regulated rather than assumed. Just as medical treatments require dosage and suitability assessments for the patient and convenience for the healthcare system, so too should GRx consider not only the patient's needs but also ecosystem carrying capacity, ecosystem health, and nonhuman life needs. As a consequence, access to environments, especially when characterized by specific biodiversity or vulnerable habitats, sensitive structures, and high therapeutic potential, must be regulated, seasonally restricted, group-limited, or even denied in cases where ecological integrity is at risk. Meanwhile, other high-impact activities (e.g., mountain-biking, nordic walking, large group excursions) can be redirected elsewhere, or in specifically monitored paths, without diminishing their value or effectiveness (Al-Romeedy et al., 2025; Shukla et al., 2025). While this may raise concerns about equity, the alternative might be an ecological collapse, which undermines justice in the long term not only for people in therapeutic needs but for the entire human society (Ipbes, 2019; IPCC, 2023; Steffen et al., 2007).

A third implication concerns the design and funding of NBI through restoration attempts or small-scale rewilding interventions. These must recognize nonhuman agency and ecological time. Ecological restoration is not instantaneous, nor is it always linear, because the healing and the resilience path of ecosystems unfold on scales far longer than a funding cycle or a clinical program duration, which cannot be based on a misunderstood notion of reciprocity. Interventions must therefore be humble in scope, capable of prioritizing ecosystem-led regeneration over human-led transformation. This may require resisting the urge to "improve" a site for therapeutic use and instead supporting spontaneous rewilding, even if it makes the space less accessible or "user-friendly" in the short term (Pettorelli and Bullock, 2023). Ultimately, we must reduce human power and extend our time frame to adapt to Nature's relatively slower rhythms. This means embracing contemplation, patience, and "slow medicine" as part of a deeper (syn)ecological mindset. Operationalizing this ethic requires a cultural shift: from seeing Nature as a passive backdrop for wellness, which should also accept our active interventions to maximize the services it gives us, to recognizing it as a co-participant into healing, with its own needs, rhythms, and limits. GRx and NBI practitioners must therefore be equipped with ecological literacy and be available to open a dialogue with environmental scientists (Salerno et al., 2025) to better understand the asymmetries and responsibilities involved in engaging with

ecosystems that contribute to human health. It is time to feel like an active part of the crew on "Spaceship Earth" (Fuller, 1969) and not just indifferent passengers.

Conclusions

Within the growing evidence of our dependence on Nature for human survival and health, the need to reconnect with healthy and well-functioning ecosystems becomes increasingly urgent. Embracing this awareness, we must rethink what it means to be in a relationship with the Nature that sustains us. The concept of human–Nature reciprocity, while intuitively powerful, can obscure the deep asymmetry between what humans receive from Nature and what they can meaningfully offer in return. Indeed, genuine reciprocity cannot be measured by equivalence or guided by utility; instead, it must be rooted in humility, restraint, and an ethic of relational interbeing. Grounded in Indigenous knowledge systems, biocultural ethics, systems thinking, and ecological science, this perspective calls for less intervention and more listening, for practices that prioritize ecological time, nonhuman agency, and long-term coexistence, especially when we turn to Nature for therapeutic purposes. Such relational frameworks also align with One Health, as they recognize that human well-being cannot be disentangled from the health of ecosystems and nonhuman life. Integrating Indigenous-led perspectives with ecological science can therefore offer more comprehensive and ethically grounded approaches to NBI and GRx, supporting both human healing and the long-term flourishing of ecosystems. Ultimately, what is needed is not a new transaction but a renewed approach that accounts for the responsibility we have to prevent harm to ecosystems. In the face of ongoing environmental loss, such a perspective is not only ethically necessary but also emotionally regenerative. It aligns our desire for healing with the long-term flourishing of the systems we are part of and reminds us that true reciprocity may lie less in giving back and more in knowing when to stop taking.

Authors' Contributions

A.S. led the writing of the original draft. All authors contributed to developing the conceptual framework, reviewing the literature, writing and editing.

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