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EDITED BY
Fernanda Michalski,
Universidade Federal do Amapá, Brazil

REVIEWED BY
Martin Konvicka,
University of South Bohemia in České Budějovice, Czechia

*CORRESPONDENCE
Meredith Root-Bernstein
meredith.root-bernstein@mnhn.fr

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A perspective on restoration with foundation plants across anthropogenic dry forests of the Southern Cone and the Sahel

Meredith Root-Bernstein[1,2,3]*, Shalom D. Addo-Danso[4] and Brandon Bestelmeyer[5]

[1]Unité Mixte de Recherche (UMR) Center for Ecology and Conservation Sciences, Museum National d'Histoire Naturelle/Centre National de Recherche Scientifique (CNRS), Paris, France, [2]Center for Applied Ecology and Sustainability, Pontificia Universidad Católica de Chile, Santiago, Chile, [3]Instituto de Ecología y Biodiversidad, Santiago, Chile, [4]Council for Scientific and Industrial Research (CSIR)-Forestry Research Institute of Ghana, Kumasi, Ghana, [5]U.S. Department of Agriculture- Agricultural Research Service (USDA-ARS) Range Management Research Unit, Jornada Experimental Range, New Mexico State University, Las Cruces, NM, United States

Rewilding is a flexible conservation approach that may be applicable to a wide variety of ecological, historical and socio-cultural contexts. We believe that comparative socio-ecological research on woodland habitat trajectories among contexts is an excellent opportunity to consider possible rewilding approaches. Here, we draw on a comparison between arid and seasonally dry woodlands of the Sahel region of Africa and the Southern Cone of South America. The two regions, while sharing a common Gondwanan floral origin, differ in terms of subsequent biogeographical processes and have different climatic gradients. Historically, both regions were colonised, although along different models, and the Southern Cone has experienced greater land-use change and agricultural modernisation. Culturally, both regions have indigenous populations with traditional management techniques and local ecological knowledge, although attention to these topics in research and conservation has had different emphases in each region. Rewilding, focusing on charismatic animals, has been proposed and implemented in some parts of the Southern Cone, but has hardly been mentioned for the Sahel. We discuss the applicability of potential rewilding models involving key plants for each region, and what a plant-focused rewilding practice could gain from a comparative approach in the two regions.

KEYWORDS

Southern Cone, Sahel, rewilding, megaflora, savanna, woodland

Introduction

Rewilding is an approach to conservation and restoration that focuses on ecological functions and processes, rather than on species composition or habitat structure. Rewilding is usually put into practice by using (re)introduced key species as "natural restoration tools" while maintaining relatively low land use intensity and adaptive management where necessary (Carver et al., 2021). It has been argued that rewilding projects should be both socially and ecologically context-specific (Root-Bernstein et al., 2017a). Nevertheless, most rewilding policy and practice recommendations are framed in global or general terms (e.g. Pettorelli et al., 2018; IUCN, 2021). In addition, most practical experience with rewilding comes from North America and Europe (see Pettorelli et al., 2018). Here we focus on two large regions, the Sahel [in which we include broadly the transition between the Sahara and tropical forests from East to West Africa (Campbell et al., 2021)] and the Southern Cone of South America (in which we include the arid diagonal), which present interesting similarities and contrasts (Figure 1). Furthermore, in this paper we focus on rewilding with plants.

Most of the focus in the rewilding literature has been on reintroducing animal species, usually megafauna (Bühne et al., 2022). But key plant species can structure ecological interactions (Enquist et al., 2020; Schweiger and Svenning, 2020) and can have cultural importance and charisma (Hall et al., 2011; Yadav et al., 2024). Our definition of rewilding with plants is that it focuses on these ecologically structuring and culturally important "megaflora", or more generally, "foundation plants" (cf. foundation species; Ellison, 2019). These are primarily trees and shrubs, palms, and cacti, which have foundational roles interacting with other species and abiotic ecosystem components (e.g. soil). The focus on foundation plants has the goal of contributing to a natural restoration of ecological processes. However, unlike traditional reintroduction and conservation projects, in rewilding the goal is not primarily to improve the conservation status of a given species (this can be an additional goal), nor is it composition-oriented (with targets for species presence or biodiversity level). Rather, it focuses on recovering ecological functions and ecosystem processes. One strand of rewilding, trophic rewilding, focuses on reintroducing herbivores and carnivores with the justification that trophic interactions have a top-down effect controlling vegetation (e.g. Svenning et al., 2019). If this were always the case or the whole story, there would be no argument for the efficiency of intervening directly to restore plant populations to achieve desired rewilding outcomes. However, the top down vs. bottom up debate in ecology has led to the understanding that both situations can exist in nature (Meserve et al., 2003), for example in drylands with variable rainfall, and in such bottom up cases and situations direct intervention on plants would be appropriate. In addition, there are foundational plant functions that are not directly controlled by herbivory, e.g. the ecological legacy effects and biodiversity benefits of old trees and deadwood (Garbarino et al., 2015; Hämäläinen et al., 2023). To claim that rewilding can only be enacted by animals via trophic impacts would be to confuse a specific causal pathway with a desired ecological outcome.

Further, rewilding with plants is different from some other forms of restoration or conservation in that it strongly favors the

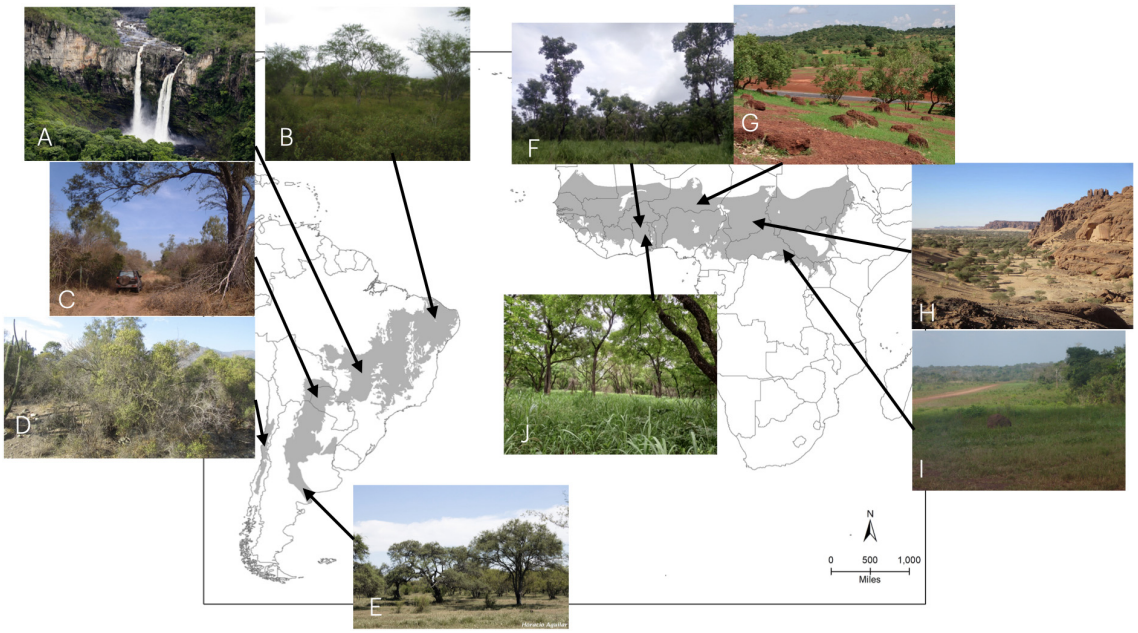

FIGURE 1
The main woodland habitats considered in this paper. They include **(A)** Cerrado (By Marcelo Camargo/Agência Brasil, CC BY 3.0 br), **(B)** Caatinga (Allan Patrick from Mossoró, Brasil - IMG_0026, CC BY-SA 2.0), **(C)** Dry chaco (By Peer V - Own work, CC BY-SA 3.0), **(D)** the WWF Ecoregions Chilean matorral (locally known as espinal; photo MR-B), **(E)** Espinal (photo Wikabyel, CC BY-SA 4.0), **(F)** West Sudanian Savanna (NOAA, US Gov, Unidentified, Public Domain), **(G)** Sahelian Acacia Savanna (photo SAD), **(H)** East Sudanian Savanna (David Stanley from Nanaimo, Canada, CC BY 2.0), **(I)** Northern Congolian Forest savanna (Cnatra09, CC BY-SA 3.0), **(J)** Guinean Forest-Savanna (photo SAD).

recovery of natural or naturalistic habitat structures. Naturalistic plantation structures such as nucleation clusters can potentially satisfy this criterion where they may lead, through succession, to naturalistic habitat. Rewilding with plants also aims to provide the conditions for greater species' autonomy, agency, and spontaneous self-regulation (i.e. "passive management"). This implies the acceptance of novel and unpredicted ecosystem trajectories. However, it does not mean that plants in rewilding projects cannot have interactions with humans, such as having instrumental value as restoration "tools", or providing resources, e.g. timber and non-timber forest resources, where these can be harvested sustainably. Passive management, or the redistribution of autonomy and control between humans and other species, also does not mean no management at all: control of invasive alien plants, insect outbreaks or plant diseases, fire frequencies, or woody encroachment of ancient grasslands would be appropriate management choices in many contexts. The form of management favored by a rewilding approach would, however, tend as much as possible towards management through reintroduction of natural ecological functions and processes.

Humans have manipulated vegetation to achieve functional ecosystems through planting, agriculture, horticulture, forestry, improving soil, burning, mowing, coppicing, and so on, for millennia. While traditional management, agriculture, forestry, ecological restoration, or plant conservation may use some methods that overlap with what we describe above as rewilding with foundation plants, it is the goals and ethos related to jump-starting the spontaneous reassembly of functional natural ecosystems that make it distinct as a practice. In the same way, rewilding with animals is not identical to domestication, taming, hunting, pastoralism, species translocation, *in situ* conservation, or other forms of manipulating animals, although some of the methods may overlap. For example, tree planting is to rewilding with foundation plants what species translocation and reintroduction are to rewilding with megafauna: a practical method shared across several other practices, which may however be implemented to achieve a specific and different set of goals within rewilding.

Here we focus on rewilding with foundation plants in the Sahel and the Southern Cone, two less-considered areas for such an approach. The Sahel and the Southern Cone have very different faunas, but much of their floras share a common Gondwanan origin (Carta et al., 2022). Both regions have generally experienced considerable defaunation (Stuart, 2015) and long histories of anthropogenic disturbance (Pausata et al., 2020; Borrero, 2022). They also differ biogeographically in important ways: the Sahel is an east-west horizontal region with a limited but extreme dry-to-moist north-south gradient, while the dry woodlands of the Southern Cone form a diagonal southwest- northeast distribution divided by the rain shadow and distributional barrier of the Andes (Couvreur et al., 2021; Campbell et al., 2021). As we will discuss in more detail below, they also have divergent if comparable cultural and socioeconomic histories and current conditions.

Comparisons and contrasts

Biogeography of the Sahel and Southern Cone

Both the Sahel and the Southern Cone of South America, except for the extreme of Patagonia, have a common plant origin in Gondwanan or Holotropical flora (Carta et al., 2022). Leguminosae, Moraceae, Lauraceae and Annonaceae dominate tropical rainforests on both continents (Pennington and Dick 2004). In turn the Amazonian tropical forests are the evolutionary source for most dryland woodland species in South America (Antonelli et al., 2018). A similar diversification during past periods of cooling and drying seems to have occurred for plant taxa in Africa (Monthe et al., 2019; Couvreur et al., 2021). The Sahara has fluctuated between a "green" savanna with wetlands and an arid desert since the Eocene (Larrasoaña et al., 2013), and long term climate variation continues to largely explain the Sahara-Sahel boundary (Thomas and Nigam, 2018; Brandt et al., 2015). Changing patterns of aridity in southern South America are due to the interactions of changing ocean currents and Andean uplift (Garreaud et al., 2010). The fauna of South America was strongly altered by the Great American Biotic Interchange (Carrillo et al., 2015), and was also more affected by megafaunal extinctions than African fauna (Stuart, 2015). In the Southern Cone, we can identify a set of arid, semi-arid and seasonally dry woodland types including Chilean Espinal and sclerophyllous woodlands, the Chaco Seco, the Argentinian Espinal and Caldenal woodlands, and the Cerrado (we also include the Caatinga to complete the so-called arid woodland diagonal) (Campbell et al., 2021). Some important wooded habitats also have substantial grass cover (Overbeck et al., 2022). In the Sahel region, we find desert thornscrub, Afrotropical dry thorn savanna and thornscrub, Afrotropical moist mixed savanna, and Guinea savanna (Campbell et al., 2021). According to Campbell et al. (2021), the Guinea savanna is comparable to the Cerrado, and the Afrotropical moist mixed savanna is comparable to the Chaco Seco and Argentinian Espinal.

Different critical research traditions

Different heritages of colonization (Horvath, 1972), development, land tenure, and land-use change have affected how dry forests and woodlands in each region are perceived, studied and managed. Following the extension of the Incan empire into parts of southern South America, the colonization of that region by the Spanish was (post-1500) an extension of imperial colonialism focused on resource extraction, although subsequent historical waves of post-independence colonialism starting in the 1800s focused on settlement and elimination of indigenous polities (Combès et al., 2009; Delrio et al., 2010; Harambour-Ross, 2012; Covey, 2020). By contrast, European colonialism in the Sahel was primarily focused on imperial extraction and trade, while previous

North African Muslim campaigns were also a major force shaping a complex region of multiple ethnicities and kingdoms (Webb, 1995; Calkins and Ille, 2014; Mann, 2021). Thus both regions have undergone significant cultural change or syncretism over the past centuries, with important implications for indigenous livelihoods practices and ecological knowledge. Interestingly, in the Sahel and in Africa in general we find many post-colonial critiques of productivity, fire, pastoralism and degradation (Fairhead and Leach, 1996; 2003; Leach and Mearns, 1996; André et al., 2003; Davis, 2007; Ballouche 2019; Benjaminsen and Hiernaux, 2019; Hoag, 2022). By contrast in the Southern Cone colonial discourses shaping perceptions of the landscape and its management are less often explicitly critiqued (but see Bestelmeyer, 2014; Le Polain de Waroux et al., 2016; del Giorgio et al., 2022; Cypher, 2022).

In addition we observe different attitudes towards local subsistence practices in woodlands in the two regions. The Southern Cone sees industrialization of agriculture for export as key to development (e.g. Kay, 2002; Norberg, 2019). For most of the twentieth and twenty-first century, Argentina and Paraguay have favored cattle ranching, plantations and the expansion of soy monocultures (Norberg, 2019). During the same period Chile has favored large, modernized fruit, wine and vegetable production for export, and promoted plantations of eucalyptus and pine (Kay, 2002; Navarro et al., 2005). This has led to a long-term exodus of the rural population to urban areas (Sili, 2018). In complement to these trends, conservation of woodlands typically seeks to preserve or restore high-profile "natural habitats" such as remote areas or temperate forests with limited human uses (Squeo et al., 2012; Wakild, 2015; Grau et al., 2015). Enforcement of deforestation regulations is highly variable (Le Polain de Waroux et al., 2016). Woodland restoration is in many cases carried out as industrial compensation for habitat destruction, and mainly consists of enclosed tree plantations. Techniques appropriate for arid and semi-arid habitats such as nurse species or nucleation are rarely applied (Root-Bernstein and Silva, 2022).

By contrast development goals in the Sahel are focused on improving the conditions of smallholder agricultural populations (Mortimore, 2016; Lalou et al., 2019). Africa, including in particular the Sahel, is urbanizing rapidly (Güneralp et al., 2017). This has not (yet) produced the demographic, land-use and conservation transitions seen in the Southern Cone. Thus, restoration and management in the Sahel region, which is mainly driven by farmer and community-led initiatives, continues to focus on creating productive habitats for peasant economies by addressing drivers of land degradation (e.g. Lipper et al., 2010; Lahmar et al., 2012; FAO, 2016; Maisharou et al., 2015; Pasiecznik and Reij, 2020; Assèdé et al., 2021). Restoration mainly consists of planting economically valuable trees, forming enclosures to protect them, and managing rangelands, soil and water resources (Chirwa and Mahamane, 2017). Drought, violence, and food insecurity, and inclusion of women and youth, as well as minority groups are key issues that intersect with restoration and conservation (Abiodun et al., 2020; Pasiecznik and Reij, 2020).

Despite more attention to rural development in the Sahel, the Southern Cone seems to lead the way in considering local ecological knowledge. While the knowledge of mestizo peasants of the Southern Cone has been overlooked (but see Root-Bernstein et al., 2017c; 2022; Costa, 2021), research on the ecological knowledge and practices of indigenous populations is relatively abundant (e.g. Rozzi, 2015; Joa et al., 2018), as are indigenous accounts of their own environmental knowledge and ontologies (e.g. Loncon, 2023; Krenak, 2022; Raoni and Dutilleux, 2019; Kopenawa and Albert, 2010). In the Sahel, such scholarship appears to be less influential (Sacande and Muir, 2022), although we can find abundant ethnobiology (e.g. Boadu and Asase, 2017; Boakye, 2018; Van Huis, 2017, 2022; Gouwakinnou et al., 2019) and ontological reflection (Mbembe, 2023).

Comparing and contrasting woodland dynamics

Across the Sahel we find some shared issues around dryland forest and woodland restoration. One constant theme is land degradation/desertification (Swift, 1996; Larrasoaña et al., 2013; Thomas and Nigam, 2018; Brandt et al., 2015). Land degradation in forests and woodlands (as variably defined in the literature) can involve processes including land clearing for agriculture, overexploitation of woody plants such that regeneration and recovery cannot stabilize plant populations, overstocking that limits plant recovery, reduced cover that leads to soil erosion, falling water tables due to increasing aridity and water withdrawals for agriculture, and fuel buildup that leads to high intensity fires that led to shifts in plant life forms (Bestelmeyer et al., 2015; Grünzweig et al., 2022; Mortimore and Turner, 2005; Peinetti et al., 2024). In some parts of the Sahel region we also see impacts of modernization (also present in the Southern Cone), such as exotic timber forestry leading to increasing fire risk, or reduction in livestock movements leading to overgrazing (Biaou, 2009). Another key issue is the role of good governance in achieving restoration outcomes. This is particularly critical in areas of the Sahel with weak states or with ongoing conflicts (Fletcher et al., 2022; Root-Bernstein and Mugelé in press). However, there are certain countries including Ghana where there are policies and legislative frameworks to promote good governance and citizen participation, especially land owners and local communities in the management of forest/woodland resources and restoration efforts (Addo-Danso et al., 2020).

In the Southern Cone, we find a different set of key research interests. Important themes include the roles of fire and livestock in shaping natural woodland and forest dynamics and patterns. In the Bolivian Cerrado, use of fire in wet seasons benefits savanna and doesn't affect forest, but livestock overgrazing prevents use of fire for savanna management by removing burnable biomass (Veldman, 2010). Low intensity cattle grazing is reported to be better than cattle exclusion for maintaining typical cerrado understory vegetation and preventing woody encroachment (Durigan et al., 2022). In the Chaco, livestock produce a mosaic of grazing effects with persistent vegetation loss in limited areas near to water sources (Tálamo et al., 2021). This mosaic of varying vegetation cover, featuring open areas alongside intact forest, may have important positive effects on biodiversity (Bestelmeyer, 2014). Recovery of valuable tree species can occur over time with grazing management and protection from thorny nurse plants (Tálamo et al., 2015, 2021). European livestock raised by the Mapuche indigenous peoples may have formed the

now-threatened espinal and caldenal woodlands in Argentina (Cypher, 2022; Guida-Johnson and Zuleta, 2013). In woodlands of central Chile, the effects of cattle on woodland conditions are contingent on the type of pasturing (Root-Bernstein et al., 2022). Cattle with prior foraging experience that roamed freely in the woodlands all year long increased tree seedling regeneration. In contrast, cattle bought to fatten for slaughter reduced tree seedling regeneration by indiscriminately eating tree seedlings. Throughout the Southern Cone, in the absence of native large herbivores, cattle may play important ecological roles (Van Uytvanck and Verheyen, 2014; Mazzini et al., 2018; Johnson et al., 2018).

Across the Sahel and the Southern Cone we also see opportunities to use the comparative method to investigate general issues in woodland management and natural dynamics. For example, while it appears that combinations of factors cause woodland ecosystem collapses, we know little about the factors that influence trajectories of restoration or succession away from collapse (Newton 2021). Finding woodlands in both regions that are comparable in terms of size, management, restoration technique, or climate, and then following how differences across them may influence trajectories of recovery could be a useful exercise. It may be important, both in the Sahel and the Southern Cone, to clearly distinguish between habitat changes as forms of natural resilience or succession, and habitat changes as barriers to certain economic activities. Preventing woodland change to preserve associated economic uses of woodlands may lead to woodland loss, such as via land conversion to pasture or cropland use. Although the Southern Cone and to a lesser extent the Sahel are invested in sedentary, highly specialized economies (e.g. industrial monocrops), more flexible, mixed, and mobile livelihoods have long been adaptations to variation and change. While transhumance and nomadic pastoralism have existed in both regions, they remain only in a limited form in the Southern Cone, and are threatened in the Sahel (Nwangwu et al., 2020). We also need to take into account that different variables drive woodland regeneration and recovery across the two regions. Notably, variability in precipitation controls regeneration of trees in South America but not in Africa (Holmgren et al., 2013). Thus, herbivory escape due to high precipitation pulses is possible in South America, but may not be possible in Africa. Adaptive differences between tree species in each region mean different restoration and rewilding strategies will be necessary.

Recommendations for rewilding with plants from the comparative perspective

Woodland change is inevitable. Rewilding needs to be adjusted to context (Root-Bernstein et al., 2017b), and ongoing processes of climate and social change are among these contextual aspects. It will be important to recognize where woodland restoration is appropriate considering ecological history, function, and potential, and where establishing trees represents intentional land conversion from long-term grasslands that never supported trees (Veldman et al., 2015). A rewilding approach to restoration can embrace novel trajectories influenced by climate change, globalization, and evolving anthropogenic disturbances, while taking a holistic approach to bringing back a functional ecosystem. In regions like the Southern Cone where preserving nature values is on the restoration agenda, a rewilding approach that embraces areas that some consider to be degraded (Macchi and Grau, 2012) should be considered as an important tool for preserving natural habitats. In the Sahel, where development and subsistence issues are more prominent, it is important to recognise that low-nutrient soils and arid conditions can support a mosaic of woodland or forest islands of varying degrees of productivity (e.g. André et al., 2003; Fairhead and Leach, 1996). Pragmatically, taking into account governance limitations, the need for adaptation, and resources, it may be most feasible to focus on mosaic restoration and connectivity of landscapes (Hobbs et al., 2014). The challenge is to be able to guarantee spontaneous and autonomous habitat development around woodlands exploited for human livelihoods and kept in a more static condition. This might be envisioned as a mosaic of agricultural lands and woodland types with different rates of change and degrees of autonomy in their successional trajectory. Such mosaics can provide a diversity of ecosystem services (e.g., Kunst et al., 2016).

In Table 1 we suggest desirable plant rewilding baselines, appropriate techniques, compatible human uses, barriers and opportunities. An interesting difference across the two zones is that while the entire Southern Cone experienced clear moments of significant ecological and socio-ecological change at a regional scale, which can serve as baselines—the megafaunal extinctions and colonization—similar regional scale shared baselines are not obvious for the Sahel. Climatic dynamics affect the position of aridity gradients but have not necessarily reorganized habitat types and land uses in the entire region. Thus, baselines in the Sahel are likely to depend on local histories of species extirpation, land-use and livelihoods changes.

In both zones, a small number of projects have already begun to explore the rewilding space, although with limited attention to plants. The "socio-ecological rewilding" proposed and initiated by the non-governmental organization Kintu for central Chile is focused on re-establishing the plant-animal interaction between guanacos (*Lama guanicoe*) and the native acacia *Vachellia caven* (Root-Bernstein et al., 2017b; Guerrero-Gatica and Root-Bernstein, 2019). Guanacos may also disperse other endemic and rare trees in central Chile, including the Chilean palm (Guerrero-Gatica and Root-Bernstein, 2019; Cordero et al., 2021), which could be the focus of future rewilding actions. The largest implemented rewilding project in the Southern Cone, Parque Iberá, is run by a privately funded foundation, and does not to our knowledge focus specifically on any megaflora (Zamboni et al., 2017). However, it is worth noting that this project has been the subject of fierce national controversy concerning the scientific justification for species translocations which have been funded with support from the Argentinian government (Balza et al., 2023; de las Mercedes Guerisoli et al., 2023a, b). This is seen as unjustifiably depriving publically-funded research and conservation of resources, and of diverting funding from conservation of species in their contemporary ranges, which is claimed to be more important than reintroductions to historical ranges. The attack by publicly

TABLE 1 Desirable baselines for rewilding, suggested implementation, and barriers and opportunities for implementation. .

	Desirable baselines	Methods	Compatible activities	Barriers	Opportunities
Southern Cone	• Pre conquest/ colonization • Pre megafaunal extinctions	• Naturalistic tree planting of rare and declining megafloral spp. (e.g. *Jubaea chilensis*) • Naturalistic tree planting in deforested areas or in abandoned agricultural areas • Translocation of arid-adapted tree spp. into areas becoming more arid due to climate change (e.g. southwards) • Re-establishment of natural seed dispersal mechanisms (e.g. via animal spp. reintroductions, livestock extensive management/ transhumance) • Maintenance of historical fire regimes e.g. through livestock management	• Sustainable non-timber forest product harvest • Traditional management of woodlands for traditional resources • Silvopastoral management (extensive year-round pasturing and transhumance) • Traditional swidden agricultural incorporating return times and scales that allow natural successional processes	• Scientific validation of traditional woodland management and sustainable harvest practices is often lacking, slowing integration into national and international restoration, management, and adaptation schemes • An industrial agricultural orientation across the region devalues subsistence and non-market values of traditional woodland management; leads to extensive land-use change • A strong forestry and industrial compensation orientation favors gridded tree planting with a compositional rather than a functional focus • ENSO variations and tree establishment dependency on rainfall in this region can be a barrier to tree establishment in some years • Increasing aridity due to climate change is a challenge to the success of traditional tree planting methods, as well as a factor in ecological change trajectories • Ownership of land in the dry forest/woodland regions is to a large extent private; limited public protected area coverage in these habitats; traditional access rights have been lost or are under treat across the region • Competition for limited funding leads to exaggerated scientific conflicts over conservation and restoration priorities	• International treaties such as the United Nations Convention to Combat Desertification, Convention on Biological Diversity, requiring signatories to take action to restore drylands and protect biodiversity; GEF projects • Ecosystem based Adaptation and other forms of Nature-based Solution for climate change adaptation under the relevant international treaties and their funding mechanisms; tree-based techniques can be validated and introduced • Growing discussion of rewilding across the region • Build consensus across multiple stakeholders across sectors, e.g. nature conservation, climate adaptation, rural development, heritage protection, Indigenous communities
Sahel	• Pre local extirpations of megafauna • Pre local overharvest/ deforestation	• Naturalistic tree planting of rare and declining megafloral spp. (e.g. *Tamarindus indica* in Sudan) • Naturalistic tree planting in desertified areas or in areas of agricultural land abandonment • Translocation of arid-adapted tree spp. into areas becoming more arid due to climate change • Re-establishment of natural seed dispersal mechanisms (e.g. via animal spp. reintroductions, livestock extensive management/ transhumance) • Traditional forest island creation methods (seedling transplantation, soil enrichment, etc.)	• Sustainable non-timber forest product harvest (e.g. fruits) • Traditional management of woodlands for traditional resources • Silvopastoral management (extensive year-round pasturing and transhumance) • Traditional swidden agricultural incorporating return times and scales that allow natural successional processes	• Political instability and conflict in some countries leads to local degradation and interruption of restoration projects • Scientific validation of traditional woodland management and sustainable harvest practices is often lacking, slowing integration into restoration, management, and adaptation schemes • Misidentification of areas with low-density woody vegetation as degraded and requiring reforestation • Natural and climate-related fluctuation in the Sahara desert boundary can be mistaken for habitat mismanagement, leading to inappropriate reforestation measures • The Great Green Wall project, while bringing in large amounts of international funding, does not systematically take into account local preferences, resource requirements, traditional practices or knowledge; tree planting within the GGW is compositionally oriented and monitoring focuses on number of trees planted rather than ecological indicators • Conflicts between settled agricultural groups and migratory pastoralists; reforestatation projects including the GGW often exclude pastoralists, overlooking the livelihoods and ecological benefits of transhumant pastoralism • Problems of access and land tenure, related to reforested areas, community forests, etc.	• The Great Green Wall continues to attract new funding flows • International treaties such as the United Nations Convention to Combat Desertification, Convention on Biological Diversity, requiring signatories to take action to restore drylands and protect biodiversity; GEF projects • Ecosystem based Adaptation and other forms of Nature-based Solution for climate change adaptation under the relevant international treaties and their funding mechanisms; tree-based techniques can be validated and introduced

funded researchers on Parque Iberá resulted in the project threatening to sue for libel. This points to the way that differences in scientific opinions about priorities can become exaggerated by competition for limited funding. It also highlights that rewilding has a strong appeal and can engage important stakeholders, but that this should not be used as an excuse to marginalize other actors. Alliances and consensus are critical to rewilding success.

Similarly, a few rewilding projects involving different megafauna exist in different regions of the Sahel, and their implementation provides evidence of the context-specific nature of such projects and

the need for certain key principles to ensure their success (Root-Bernstein et al., 2017a; Mutillod et al., 2024). A key example is the Scimitar-horned Oryx Reintroduction Project, which is jointly implemented by Sahara Conservation (a non-for profit organisation leading the reintroduction of large bird and mammal species in the Sahel), the Chadian Ministry for the Environment and Fishing, and the Abu Dhabi Environment Agency (EAD) in Chad, with the aim to recover and enhance the trophic interactions in the Sahelian grassland of Ouadi Rimé-Ouadi Achim Game Reserve through the reintroduction of the Scimitar-horned Oryx (Chuven et al., 2018; Ogden et al., 2020). The Scimitar-horned Oryx (*Oryx dammah*) was last seen in the wild in the 1980s, but the project started reintroducing the species in 2016, and by the end of 2023, the population had reached 600, and the species, which in 2000 was classified as Extinct by the IUCN Red List of Threatened Species, is currently reclassified as Endangered. The success of this huge conservation effort was achieved through a strong collaboration among key partners, the integration of scientific and local knowledge and the deployment of an effective monitoring framework that incorporates both advanced technologies and ground-based activities to monitor the reintroduced populations (Ogden et al., 2020; Majaliwa et al., 2022).

A megaflora project that has focused on restoring the wilderness of the Sahel is the Great Green Wall for Sahara and the Sahel Initiative for Restoration and Peace. This large-scale initiative was started in 2007 to restore and create a belt of 100 million hectares of through tree planting and natural regeneration in 11 founding African countries stretching some 15 square kilometers wide, more than 8,000 km long from Senegal to Djibouti (Goffner et al., 2019; Koech et al., 2020). The initiative, among other things, was designed as a strategy to combat land degradation, desertification and drought, and to would transform the lives of communities in the Sahel region. This initiative involves many stakeholders at the national and international levels who are working together to build the resilience of the Sahel landscape (FAO, 2016). It generally consists of two kinds of interventions: tree planting to prevent desertification, and women-led agricultural initiatives for local sale (e.g. https://ohmi-tessekere.in2p3.fr accessed August 2022; http://ssnrmp.org/ accessed January 2023). In several countries the Great Green Wall has been accused of favoring agriculturalist populations and ignoring the needs of itinerant pastoralists (Delay et al., 2022; Spiegelenberg, 2022). Whatever the intentions, the integration of accessible forest resources into these projects is sometimes lacking (Sacande and Muir, 2022) and reforestation takes the form of enclosed tree plantations planted in a gridded style (Mugelé 2018).

Traditional conservation initiatives in the Sahel may do better at integrating sustainable woodland resource use and management. An example of good governance integrating local ecological knowledge about tree species for reforestation and social considerations coming from the Sahel region can be found in Ghana. The Forest and Wildlife Policy of Ghana and Ghana's Forest Plantation Development Strategy seek to promote and develop mechanisms for transparent governance, equitable sharing of benefits and citizen's participation in resource management and restoration activities (Addo-Danso et al., 2020). Approaches like the Community Resources Management Areas (CREMA) in Ghana that incorporate local ecological knowledge provide examples of how to incorporate contextual knowledge into best practice. The CREMA concept seeks to encourage local communities to integrate natural resource management into their traditional livelihood strategies in areas outside forest reserves and Protected Areas. The CREMA concept has now been adopted as a viable governance mechanism for managing Ghana's forest resources for climate change mitigation activities such as the REDD+ (Asare et al., 2013). Rewilding also emphasizes the contextual specificity of habitat change and habitat management, and as such can be an important complementary tool with which policy makers can ensure the protection of biocultural diversity.

In conclusion, while there are successful examples of various elements of rewilding with plants in the Sahel and the Southern Cone, as well as conflictual or problematic examples, we see a large potential to consolidate the positive examples and initiate new projects with a full complement of rewilding characteristics. Adaptive learning is essential to adjusting rewilding with plants to different socio-ecological contexts, and a comparative approach can help accelerate this process.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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