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POLICY PERSPECTIVE

Working landscapes need at least 20% native habitat

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Abstract

International agreements aim to conserve 17% of Earth's land area by 2020 but include no area-based conservation targets within the working landscapes that support human needs through farming, ranching, and forestry. Through a review

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of country-level legislation, we found that just 38% of countries have minimum area requirements for conserving native habitats within working landscapes. We argue for increasing native habitats to at least 20% of working landscape area where it is below this minimum. Such target has benefits for food security, nature's contributions to people, and the connectivity and effectiveness of protected area networks in biomes in which protected areas are underrepresented. We also argue for maintaining native habitat at higher levels where it currently exceeds the 20% minimum, and performed a literature review that shows that even more than 50% native habitat restoration is needed in particular landscapes. The post-2020 Global Biodiversity Framework is an opportune moment to include a minimum habitat restoration target for working landscapes that contributes to, but does not compete with, initiatives for expanding protected areas, the UN Decade on Ecosystem Restoration (2021–2030) and the UN Sustainable Development Goals.

KEYWORDS
agroecology, food security, landscape conservation, native habitat, nature's contributions, restoration, working landscapes

Governments worldwide set a target to conserve 17% of the Earth's terrestrial surface within protected areas by 2020 (Convention on Biological Diversity, Aichi Target 11). While this is one of the few Aichi targets likely to be met, and potentially increased in the post 2020 Global Biodiversity Framework, no numerical area-based target exists to conserve biodiversity outside of protected areas, which in large measure corresponds to the "working landscapes" used for farming, ranching and/or forestry (Figure 1a; Kremen & Merenlender, 2018). With such landscapes expanding and becoming increasingly intensive and homogeneous (Kremen & Merenlender, 2018; Ramankutty et al., 2018), there is an urgent need to protect and restore native species diversity within them (Convention on Biological Diversity, Aichi Target 7: areas under agriculture, aquaculture, and forestry are managed sustainably, ensuring conservation of biodiversity).

There is widespread recognition of the positive role of native habitats within working landscapes (NWL: see Box 1 for a definition) for good quality of life (Díaz et al., 2018; Garibaldi et al., 2019; Kremen & Merenlender, 2018; Odum, 1969). The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) states that NWL contribute to regulating benefits such as soil protection and regeneration, water and air purification, pollination, pest control, dampening ocean acidification and climate change mitigation, while ameliorating the impacts of natural hazards such as hurricanes, landslides, and floods (Figure 2; Díaz et al., 2018). NWL also contribute to the provision of food, feed, energy, medicines, and genetic resources, as well as to the non-material aspects of a good quality of life, such as learning, inspiration, physical and psychological experiences, and supporting identities (Díaz et al., 2018). NWL form the core of multifunctional landscape management strategies aimed at promoting farm productivity, biodiversity conservation, and nature's contributions to people, uniting three science and policy paradigms: Best Management Practices, Nature Conservation, and Green Infrastructure in a coherent and evidence-based target for action (Figure 3).

1 | INCOMPLETE LEGISLATION WORLDWIDE

Despite increasing awareness of their importance, targets for NWL vary enormously among nations (Tables S1 and S2, supplementary materials). Of the 82 countries reviewed here, representing 73% of global working landscape area, only 38% set any minimum area requirement for NWL (Figure 4). Further, countries that included targets in their national laws vary widely in the percent of NWL required, and regional representation, with the majority requiring just 5% NWL and being located in Europe. Countries also vary in the type of habitats that are afforded legal protection: in many countries, only forest habitats are under legislation, whereas other highly threatened habitat types, such as native grasslands, are ignored. No evident pattern arises to explain why some countries have greater

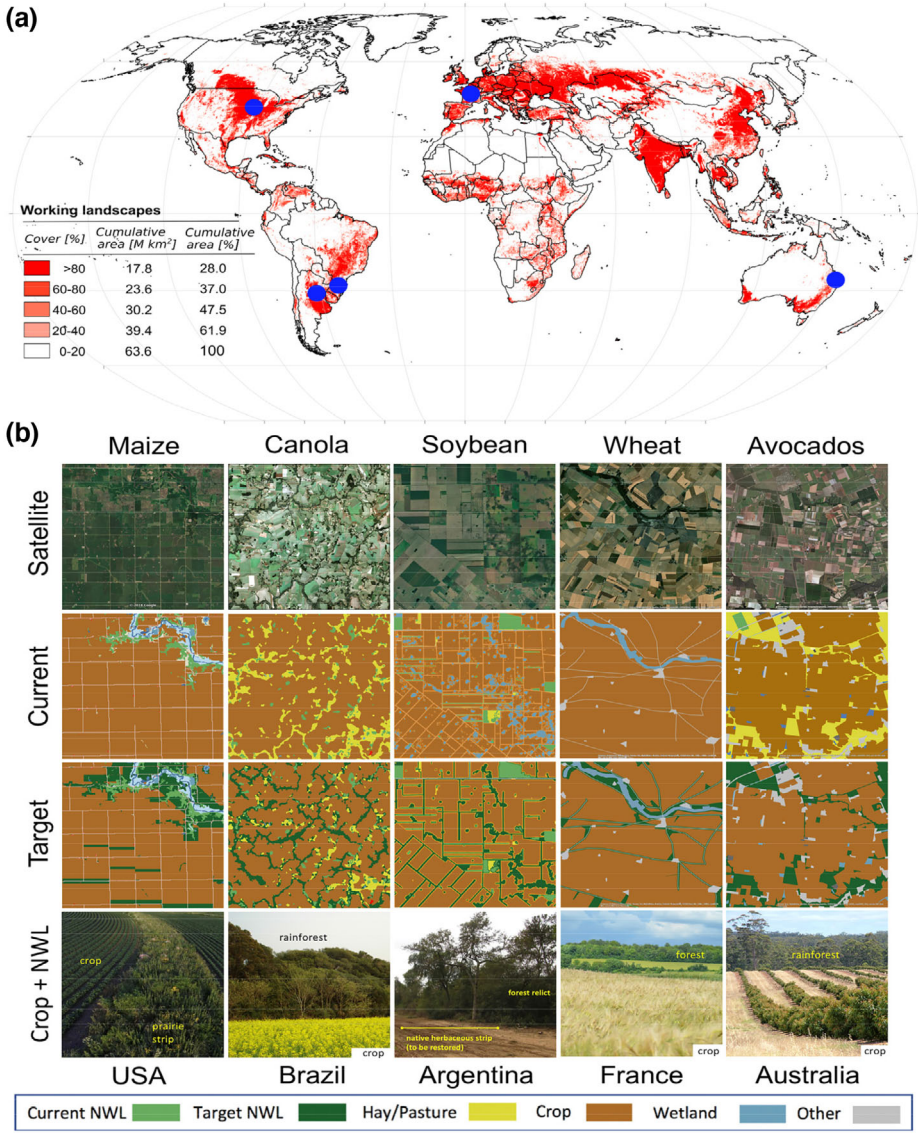

FIGURE 1 (a) Worldwide distribution of agricultural working landscapes. Colors show the percentage of area classified as crops for food, feed, fiber, or fuel (10 × 10 km global grid derived from 1 km cropland classification of Teluguntla et al., 2015). These percentages include seasonal crops (e.g., wheat, rice, maize, soybean, cotton) and continuous plantations (e.g., coffee, tea, rubber, cocoa, oil palm, recently planted afforestation), but exclude established afforestation and free-range ranching lands, which are important yet challenging to detect components of working landscapes. Blue points represent sites in (b) that show current and target land use for native habitats in selected working landscapes (NWL) around the world. The target landscape was designed by adding NWL to the current landscape following the criteria described in Box 1. Each map represents a 10 × 10 km area. USA: cultivated landscape dominated by maize and soybean (shown) benefits from the introduction of restored prairie strips (Schulte et al., 2017). Brazil: restoring native Atlantic Forest fragments in lowlands contributes to higher oilseed rape yields and farmer profits through improved pollination services (Garibaldi et al., 2016). Argentina: restoring and conserving forest relicts within an area dominated by soybean crops and exotic perennial pastures mitigates rising water tables, flooding, and salinization (Giménez, Mercau, Nosetto, Páez, & Jobbágy, 2016). France: landscapes can be managed as a form of agroforestry that can operate at the field boundaries by introducing hedgerows (Moreno et al., 2018). Australia: native habitat conservation needs to be balanced with agricultural intensification (Smith, Prober, House, & McIntyre, 2013). See the "Fewer trade-offs, more synergies" section for a discussion of the benefits and costs of such management for NWL

requirements to conserve NWL than others (Figure 4). Overall, such variation reflects country-specific differences in political, social, economic, and cultural conditions, but also the lack of clear scientific guidelines on minimum native habitat required for good quality of life (Díaz et al., 2018; Garibaldi et al., 2019; Kremen & Merenlender, 2018).

In 2020 and 2021, there are critical policy opportunities for setting global restoration targets for NWL. These include the post-2020 Global Biodiversity Framework,

FIGURE 2 Restoring native Atlantic Forest fragments contributes to higher oilseed rape productivity and farmer profits in Brazil as well as to many other contributions to people including regulation of climate and water quality, reduction of soil erosion, and flood prevention (photo taken by Rosana Halinski; Garibaldi et al., 2016)

which will be discussed at the 15th meeting of the Conference of the Parties (COP 15) to the Convention on Biological Diversity in Kunming, China. There are also current and future decisions in Europe on the minimum share of agricultural areas to be devoted to "landscape and habitat features" (which can be equivalent to NWL, depending on how they are defined) after 2020 (Table S1, supplementary materials). Restoration targets for NWL are also essential to achieve the United Nations Sustainable Development Goals and commitments for the Decade on Ecosystem Restoration (2021–2030) (IUCN-WPCA Task Force on OECMs, 2019).

Based on an empirical review of the scientific evidence (Table S3) and modeling (Figure 5, Model S1, supplementary materials), we recommend a worldwide restoration and retention target of at least 20% native habitat area within working landscapes that have >80% area already converted (Box 1). These are the most heavily transformed working landscapes, which rarely meet the requirements to be considered protected areas (Figure 2; IUCN-WPCA Task Force on OECMs, 2019) and represent locations that are failing to deliver on the dimensions for good quality of life (Figure 1). NWL may include grazing (e.g., traditional livestock grazing enhancing grassland diversity), mowing (e.g., hay meadows), harvesting (e.g., native fruits, regulated hunting), or burning (e.g., prescribed burning in scrublands for native species regeneration), as long as these activities sustain or restore native species diversity. Starting with the conservation of any remnant native habitats within working landscapes through zero net-loss policies, these remnants should be expanded through restoration to cover at least 20% of landscape area. In highly cultivated regions where native habitats now occupy much less than 20% of land area, NWL initiatives will require creative and experimental restoration actions (Hobbs et al., 2014; Tscharntke, Batáry, & Dormann, 2011). However, as our analysis shows, these restoration efforts can be implemented in ways that minimize trade-offs with farm productivity (Figure 5, Model S1, supplementary materials) while enhancing nature's contributions to people (Table S3, supplementary materials).

2 | PRIORITIZING NATIVE SPECIES

The diversity and composition of NWL modulate their contributions to people. While some benefits from sustaining biodiversity can be achieved with nonnative species, an emphasis on native habitats is essential to reduce species extirpations and extinctions. In addition to intrinsic values, native species, and their habitats, have potential for new discoveries and unanticipated uses of biodiversity (e.g., new medicines or materials), can mitigate the spread of invasive species, increase the range of nature's contributions to people, including the basis for religious, spiritual and other cultural experiences (Díaz et al., 2018).

A >20% NWL target is intended to complement, not compete with, efforts to establish protected areas, as they have different objectives (Kremen & Merenlender, 2018). Indeed, legislation for promoting NWL (Figure 4, Tables S1 and S2, supplementary materials) is different from that of protected areas. Initiatives such as the "Half-Earth Project," "Nature Needs Half," and "30% by 2030" largely focus on biodiversity conservation within systems of protected areas (Mehrabi, Ellis, & Ramankutty, 2018), and are central for species intolerant of human activities, including species with large home-ranges and those implicated in human–wildlife conflicts (Figure 3). Many of these species cannot be conserved effectively within NWL. Thus, these initiatives are critically important for global biodiversity conservation. In addition, a minimum NWL restoration target is essential to promote nature's contributions to people within the working landscapes where so many people live and work, as many of these contributions need to be provided locally (Odum, 1969). Such restoration can also enhance the effectiveness of protected areas by offering corridors and stepping stones interconnecting wild populations across landscapes that might otherwise form barriers or sinks (Defries & Nagendra, 2017; Kremen & Merenlender, 2018). NWL can therefore improve gene flow and persistence of many native species populations otherwise restricted to protected areas, while enhancing species' ability to respond to climate change (Kremen & Merenlender, 2018). As most conservation initiatives to date have focused on areas outside working landscapes, NWL offer untapped potential to protect underrepresented

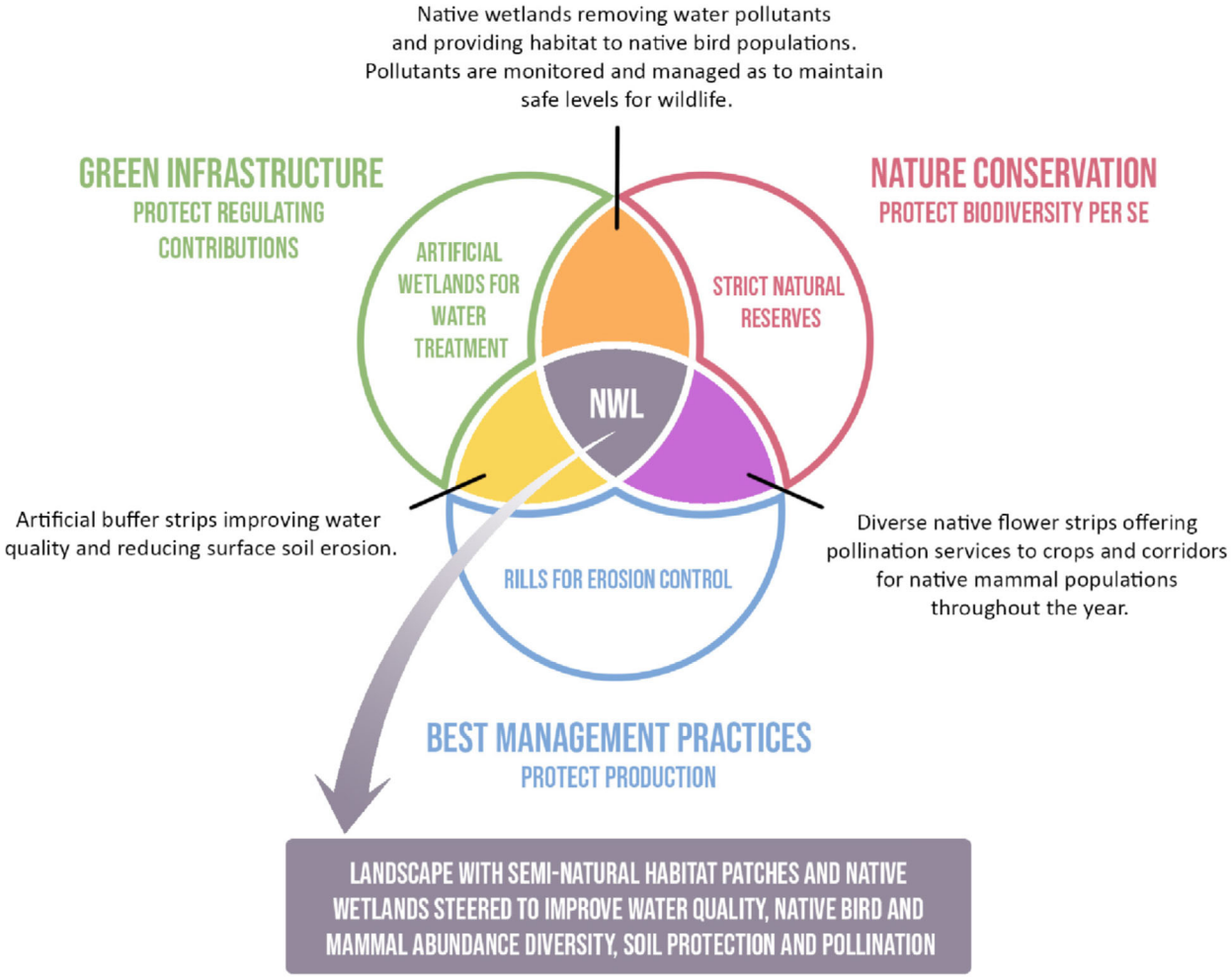

FIGURE 3 Three streams of science-policy guidelines for managing working landscapes to protect production (Best Management Practices), biodiversity (Nature Conservation) or nature's contribution to people (Green Infrastructure or Nature-Based Solutions). Multiple objectives pursued in any working landscape will entail both conflicts and synergies. While Best Management Practices initiatives have traditionally focused on the sustainability of mainstream production, they can overlap with Green Infrastructure initiatives when they simultaneously enhance other nature's contributions to people. Best Management Practices may also benefit Nature Conservation when they include habitat restoration in working lands (e.g., native hedgerows). Finally, Green Infrastructure can overlap with Nature Conservation when native habitats that are used to provide regulating contributions also help preserve threatened native species. The concept of native habitat within working landscapes (NWL) sits at the intersection of these three paradigms and seeks to enhance them simultaneously. Examples of synergistic interventions are given, considering a hypothetical agricultural region dominated by simplified seasonal crop systems. These examples also exemplify conflicts among multiple objectives, such as when artificial buffer strips dominated by a few exotic plant species improve water quality and reduce surface soil erosion but have little value for Nature Conservation (see also "Fewer trade-offs, more synergies" section)

and highly threatened environments worldwide, such as grasslands (Ramankutty et al., 2018). Furthermore, because NWL can be retained or restored while minimizing trade-offs with working landscape productivity (Figure 5, model S1, supplementary materials), it is possible for NWL conservation to succeed without driving agricultural expansion and reductions in protected areas. In some cases, NWL might qualify as "other effective area-based conservation measures" and could benefit from existing policies (CBD, 2018; IUCN-WPCA Task Force on OECMs, 2019).

3 | FEWER TRADE-OFFS, MORE SYNERGIES

Trade-offs must always be assessed and negotiated when allocating areas to NWL (Mehrabi et al., 2018), but with proper management we can minimize or eliminate these trade-offs, or even enhance overall agricultural production through synergies across nature's contributions to people (Figures 3 and 5, model S1, supplementary materials). This is possible in part because NWL can increase agricultural productivity in adjacent lands by (a) reducing erosion

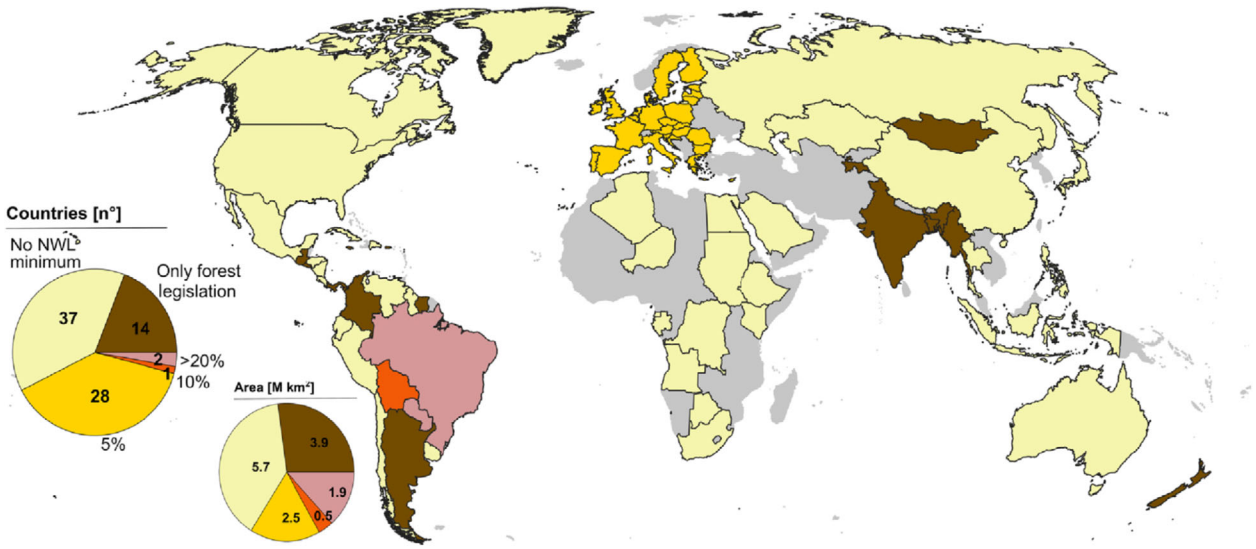

FIGURE 4 Minimum mandated area (%) of native habitats within working landscapes (NWL) under current legislation (see Tables S1 and S2 in supplementary materials for legislation by country). Pie charts show the number of countries and total area under current legislation. The category "only forest legislation" includes those countries that only legislate on the area originally covered by forests, without proposing a minimum coverage of NWL. In gray, countries not reviewed due to nonaccessible information on conservation thresholds in working lands

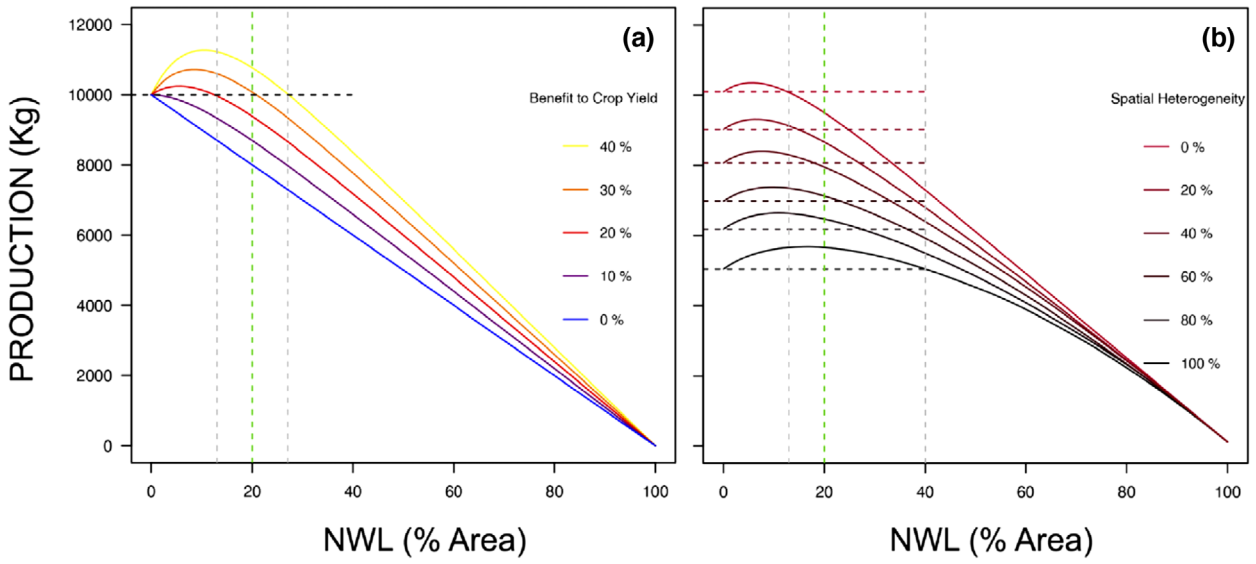

FIGURE 5 Theoretical expectation for the trade-off between area devoted to agricultural production and to native habitats within working landscapes (NWL). (a) Exponential models assuming increasing benefits (0%, 10%, 20%, 30%, 40%) from NWL to crop productivity in adjacent lands. As we reduce the percentage of cultivated land (i.e., increase the % of NWL), production at the landscape level decreases linearly (blue line). However, when native habitats benefit per hectare productivity of cultivated land by 10%, 20%, 30%, or 40% (color lines), overall production can increase at the landscape level. When 20% of the area is devoted to NWL, the required benefit is around 25%, a value consistent with observations from pollinator-dependent crops (Garibaldi et al., 2011, 2016; Joseph et al., 2020; Ricketts, Daily, Ehrlich, & Michener, 2004). (b) To be more conservative than a 25% benefit scenario, we further explored a 20% benefit scenario by increasing levels of spatial heterogeneity. This analysis shows that when allocating NWL to less productive areas, the amount of native area that can be conserved while maintaining productivity increases from 13% to 40% (vertical gray lines; the red line represents the homogeneous landscape modeled in A). See Model S1, supplementary materials for details and exploration of other functional forms

BOX 1 Restoration of native habitats within working landscapes (NWL) in at least 20% of land area

What?

Native habitats are those dominated by native species of plants and are substantially similar in composition and structure to habitats that would have been present in the absence of intensive human activities.

They can be grazed, mowed, harvested, or burned where that is consistent with continued biodiversity conservation.

Where?

Working landscapes (outside protected areas) with >80% of land sowed or planted for farming, ranching, and/or forestry (Figure 1a).

Holding sizes >10 ha.

Why 20%?

This quantitative target stems from the review of scientific evidence (Table S3, supplementary materials), suggesting that at least 20% NWL is needed everywhere to support the provision of many of nature's contributions to people simultaneously (not only crop productivity). This percentage arises as a minimum, rather than an optimum, and is a simple guide to detect the many landscapes worldwide that do not comply with such criteria (Figure 1). A simple modeling approach (Figure 5, Model S1, supplementary materials) shows that under conditions of spatial heterogeneity, and/or where there are direct contributions from nature to crop productivity, this target can be achieved with little or no trade-offs with crop productivity.

Although we advocate the 20% as a minimum target, it can also be seen as an aspiration to help guide national and intergovernmental discussions.

The 20% minimum needs to be adapted to different contexts: variation exists in the land area needed for nature's different contributions to people and different socioecological contexts (see ranges of % NWL in Table S3, supplementary materials). Model optima also vary depending on assumptions (Figure 5, Model S1, supplementary materials).

To be effective, results from this target must be monitored and redefined iteratively through adaptive management.

Spatial scale and configuration?

We propose that restoration focuses on:

- A "fractal perspective," in which the >20% target can be applied at all spatial scales, from single fields to whole landscapes. At the smallest scale, enhancing regulating contributions, such as those provided by pollinators, is likely to require >20% within each 1 × 1 km area (1 km^2 = 100 ha).
- Enhancing and expanding existing patches of native habitat.
- Areas traditionally sown and harvested but with lower crop productivity potential (Figure 5, Model S1, supplementary materials).
- Borders of roads, fences, and in the vicinity of houses.
- Environmentally sensitive areas (e.g., lowlands, river margins, and steep slopes).
- Designs that promote interpatch connectivity.

These principles can be combined in different ways to create alternative solutions given the socioecological context (Figure 1b).

Time frame?

A >20% target could be implemented gradually within areas with low NWL.

Native habitats should be kept in place to allow for several generations of most native species and for the persistence (or re-establishment) of native communities over time.

The time frame should allow for recovery of soil fertility and establishment of a healthy soil seed bank.

and improving soil biological activity and nutrient availability (Table S3, supplementary materials); (b) enhancing pollination services for pollinator-dependent crops (Table S3, supplementary materials), which are increasing in demand globally (Garibaldi et al., 2016; Mason-D'Croz et al., 2019; Ramankutty et al., 2018); (c) slowing the rapid evolution of pests and weeds (Table S3, supplementary materials; Gould, Brown, & Kuzma, 2018); and/or (d) preventing floods and regulating climate (Table S3, supplementary materials). In areas with lower potential crop productivity and/or profitability (but sometimes high value for provisioning of nature's contribution to people, e.g., wetlands), opportunities for protecting or restoring NWL are greater, and can even increase overall agronomic or economic efficiency (Figure 5, Model S1, supplementary materials; Garibaldi et al., 2019).

Especially in those landscapes where >20% NWL does not increase overall production, we argue that short-term production should not be the only motivation for managing working landscapes; more emphasis should be placed on long-term food security. A large percentage of global cultivated area now produces nonfood crops, from cotton to sugarcane, soybeans, oil palm, and maize used for biofuel or animal feed (Ramankutty et al., 2018). While current food production largely meets global caloric needs, it fails to provide the diversity required in a healthy diet, notably fruits, nuts, and vegetables (Mason-D'Croz et al., 2019). Rather than expanding the extent of intensive agricultural areas and eliminating NWL, a shift to more diverse and multifunctional landscapes sustaining native habitats alongside vegetable, fruit, and nut production could produce more nutritious food per unit-area (Mason-D'Croz et al., 2019). In this way, >20% NWL area can contribute nature's benefits to people both locally and globally. Even where net benefits from restoring NWL exist, land managers do not necessarily recognize them in the short term (a communication and information issue), and benefits as well as costs go beyond the individual farm to affect the whole of society. Thus, governmental roles such as relevant policies and legislation (e.g., Tables S1 and S2, supplementary materials) are needed to promote long-term food security.

4 | INCLUSIVE DECISION MAKING

Implementation of a >20% NWL area target poses challenges. Regardless of the starting point, conserving NWL requires coordination between different levels and sectors within governments, land owners and managers, corporations, and civil society organizations (Bartomeus & Dicks, 2019; Ellis, 2019). The integration of different social actors in codesigning and managing NWL has already proven successful for a range of conservation problems across countries (Bartomeus & Dicks, 2019; Ellis, 2019). For example, land stewardship pacts between working-lands stakeholders have delivered species conservation plans, sustainable farming practices, and habitat restoration initiatives by capitalizing on common interests (Bartomeus & Dicks, 2019; Ellis, 2019). Clearly, to succeed, NWL restoration will require global and national policy targets, such as those outlined here, alongside local implementation agreements and plans, tailored to different socioeconomic conditions (Locke et al., 2019). Instruments such as eco-labeling (which creates markets for products grown in landscapes with NWL) and strengthening of social networks (to build trust and dialog among different land users and between them and policy, extension and research agents) are critical complements to national legislations for the success of the NWL implementation.

Restoring NWL is just one crucial pathway toward a biosphere that sustains both biodiversity and nature's contributions to people (Figure 3; Kremen & Merenlender, 2018). NWL may work best in combination with complementary transitions toward ecological intensification in the cultivated portions of landscapes, such as enhanced crop diversity and including service crops in rotations (Garibaldi et al., 2019). Whichever the approach, we propose that achieving the >20% target could be enacted in phases in currently low- to nonexistent NWL areas. Such an incremental strategy would ease potential burdens on landowners while also enabling continued assessment of benefits and costs through adaptive management and policymaking.

Knowledge on the role of NWL in providing nature's contributions to people has accumulated in recent decades, offering numerous successful examples of NWL restoration and multiple associated benefits (Díaz et al., 2018; Garibaldi et al., 2019; Kremen & Merenlender, 2018). However, implementation of NWL restoration, especially through policy, remains limited (Kremen & Merenlender, 2018), and NWL continue to be degraded and eliminated (Figure 1a). The time has come to reverse this trend. Including a >20% NWL restoration target offer an unrivaled opportunity to simultaneously enhance biodiversity, food security and quality of life (Figure 3).

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AUTHOR CONTRIBUTIONS

LAG, FJO, FEM, IB, MCO, EGJ, LAS, and MG performed the scientific literature review; LAG, FJO, FEM, MCO, ACH, PB, DGC, FS, and ZM performed the national legislation review; FJO, FEM, EGJ, ACH, and CB performed the land-use classification maps; LAG, IB, GA, CAH, and MK developed the model; LAG led the writing and all

authors contributed with ideas and substantially edited the text.

ETHICS STATEMENT

The manuscript does not contain field data. Our manuscript complies with ethical scientific standards.

DATA ACCESSIBILITY STATEMENT

All data compiled here are in Tables S1–S3 (supplementary materials) and references therein. The R code of the model is also provided as a supplementary file.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

Bartomeus, I., & Dicks, L. V. (2019). The need for coordinated transdisciplinary research infrastructures for pollinator conservation and crop pollination resilience. *Environmental Research Letters*, *14*, 045017.

CBD. (2018). Protected areas and other effective area-based conservation measures. Draft recommendation submitted by the Chair, July 1–19.

Defries, R., & Nagendra, H. (2017). Ecosystem management as a wicked problem. *Science*, *356*, 265–270.

Díaz, S., Pascual, U., Stenseke, M., Martín-López, B., Watson, R. T., Molnár, Z., & Polasky, S. (2018). Assessing nature's contributions to people. *Science*, *359*, 270–272.

Ellis, E. C. (2019). Sharing the land between nature and people. *Science*, *364*, 1226–1228.

Garibaldi, L. A., Carvalheiro, L. G., Vaissiere, B. E., Gemmill-Herren, B., Hipolito, J., Freitas, B. M., … Zhang, H. (2016). Mutually beneficial pollinator diversity and crop yield outcomes in small and large farms. *Science*, *351*, 388–391.

Garibaldi, L. A., Pérez-Méndez, N., Garratt, M. P. D., Gemmill-Herren, B., Miguez, F. E., & Dicks, L. V. (2019). Policies for ecological intensification of crop production. *Trends in Ecology & Evolution*, *34*, 282–286.

Garibaldi, L. A., Steffan-Dewenter, I., Kremen, C., Morales, J. M., Bommarco, R., Cunningham, S. A., … Klein, A. M. (2011). Stability of pollination services decreases with isolation from natural areas despite honey bee visits. *Ecology Letters*, *14*, 1062–1072.

Giménez, R., Mercau, J., Nosetto, M., Páez, R., & Jobbágy, E. (2016). The ecohydrological imprint of deforestation in the semiarid Chaco: Insights from the last forest remnants of a highly cultivated landscape. *Hydrological Processes*, *30*, 2603–2616.

Gould, F., Brown, Z. S., & Kuzma, J. (2018). Wicked evolution: Can we address the sociobiological dilemma of pesticide resistance? *Science*, *360*, 728–732.

Hobbs, R. J., Higgs, E., Hall, C. M., Bridgewater, P., Chapin, F. S., Ellis, E. C., … Yung, L. (2014). Managing the whole landscape: Historical, hybrid, and novel ecosystems. *Frontiers in Ecology and the Environment*, *12*, 557–564.

IUCN-WPCA Task Force on OECMs. (2019). Recognising and reporting other effective area-based conservation measures. Gland, Switzerland: IUCN.

Joseph, J., Santibáñez, F., Laguna, M. F., Abramson, G., Kuperman, M. N., & Garibaldi, L. A. (2020). A spatially extended model to assess the role of landscape structure on the pollination service of *Apis mellifera*. *Ecological Modelling*, *431*, 109201.

Kremen, C., & Merenlender, A. M. (2018). Landscapes that work for biodiversity and people. *Science*, *362*, eaau6020.

Locke, H., Ellis, E. C., Venter, O., Schuster, R., Ma, K., Shen, X., … Watson, J. E. M. (2019). Three global conditions for biodiversity conservation and sustainable use: An implementation framework. *National Science Review*, *6*, 1080–1082, https://doi.org/10.1093/nsr/nwz136

Mason-D'Croz, D., Bogard, J. R., Sulser, T. B., Cenacchi, N., Dunston, S., Herrero, M., & Wiebe, K. (2019). Gaps between fruit and vegetable production, demand, and recommended consumption at global and national levels: An integrated modelling study. *Lancet Planetary Health*, *3*, e318–e329.

Mehrabi, Z., Ellis, E. C., & Ramankutty, N. (2018). The challenge of feeding the world while conserving half the planet. *Nature Sustainability*, *1*, 409–412.

Moreno, G., Aviron, S., Berg, S., Crous-Duran, J., Franca, A., de Jalón, S. G., … Burgess, P. J. (2018). Agroforestry systems of high nature and cultural value in Europe: Provision of commercial goods and other ecosystem services. *Agroforestry Systems*, *92*, 877–891.

Odum, E. P. (1969). The strategy of ecosystem development. *Science*, *164*, 262–270.

Ramankutty, N., Mehrabi, Z., Waha, K., Jarvis, L., Kremen, C., Herrero, M., & Rieseberg, L. H. (2018). Trends in global agricultural land use: Implications for environmental health and food security. *Annual Review of Plant Biology*, *69*, 789–815.

Ricketts, T. H., Daily, G. C., Ehrlich, P. R., & Michener, C. D. (2004). Economic value of tropical forest to coffee production. *Proceedings of the National Academy of Sciences USA*, *101*, 12579–12582.

Schulte, L. A., Niemi, J., Helmers, M. J., Liebman, M., Arbuckle, J. G., James, D. E., … Witte, C. (2017). Prairie strips improve biodiversity and the delivery of multiple ecosystem services from corn–soybean croplands. *Proceedings of the National Academy of Sciences*, *114*, E10851.

Smith, F. P., Prober, S. M., House, A. P. N., & McIntyre, S. (2013). Maximizing retention of native biodiversity in Australian agricultural landscapes-The 10:20:40:30 guidelines. *Agriculture Ecosystems and Environment*, *166*, 35–45.

Teluguntla, P., Thenkabail, P. S., Xiong, J., Gumma, M. K., Giri, C., Milesi, C., … Yadav, K. (2015). Global food security support analysis data at nominal 1 km (GFSAD1 km) derived from remote sensing in support of food security in the twenty-first century: Current achievements and future possibilities. In *Remote Sensing Handbook (Volume II): Land Resources Monitoring, Modeling, and Mapping with Remote Sensing* (pp. 131–160). P. S. Thenkabail (Ed.). Boca Raton, London, New York: Taylor and Francis Inc.\CRC Press.

Tscharntke, T., Batáry, P., & Dormann, C. F. (2011). Set-aside management: How do succession, sowing patterns and landscape context affect biodiversity? *Agriculture Ecosystems and Environment*, *143*, 37–44.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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