Received: 10 February 2023 | Accepted: 8 May 2023
DOI: 10.1002/2688-8319.12244

Ecological Solutions and Evidence
BRITISH ECOLOGICAL SOCIETY

PERSPECTIVE

Restore or rewild? Implementing complementary approaches to bend the curve on biodiversity loss

Nathalie Pettorelli[1] | James M. Bullock[2]

[1]Institute of Zoology, Zoological Society of London, London, UK
[2]UK Centre for Ecology & Hydrology, Wallingford, UK

Correspondence
James M. Bullock
Email: jmbul@ceh.ac.uk

Funding information
Natural Environment Research Council, Grant/Award Number: NE/V006525/1; Research England; UKCEH National Capability, Grant/Award Number: 06895

Handling Editor: Max Lambert

Abstract

1. Restoration and rewilding are both relevant conservation approaches to addressing the current nature, health and climate crises. Here, we discuss the benefits of integrating restoration and rewilding in conservation projects.
2. We highlight how such integration could increase the amount of space available for nature recovery; boost knowledge exchange and raise nature recovery ambitions; enhance landscape heterogeneity and dynamics and improve large-scale connectivity.
3. In particular, the two approaches may be deployed to exploit synergisms. We argue that developing a portfolio of integrated approaches that capitalise on the strengths of both restoration and rewilding and target different scales and socio-ecological contexts is the best way to jointly address the biodiversity and climate crises.
4. We call for major policy platforms and international funding agencies to support the emergence of infrastructures and frameworks that facilitate the coordination and integration of the restoration and rewilding agendas. Such a step would benefit biodiversity and support broader efforts to integrate different conservation strategies into whole landscape approaches.

KEYWORDS
ecosystem collapse, environmental legislation, nature-based solutions, protected areas, restoration, rewilding, wildlife management

1 | INTRODUCTION

Biodiversity loss and climate change are arguably the most pressing challenges of our time, each intimately and inextricably linked with human well-being and the future of the living world. These two major environmental crises are fundamentally connected, not only in terms of the driving processes, feedback and mechanistic links, but, critically, also in terms of potential solutions (Pettorelli et al., 2021). Nature recovery, in particular, has gained significant traction in recent years as a solution to jointly address the biodiversity crisis and climate change emergency, with research suggesting that the restoration of the planet's most degraded areas in combination with the protection of biodiversity hotspots could significantly boost carbon sequestration capacity while preventing about 70% of predicted species extinctions (Strassburg et al., 2020). The prominence of nature recovery has been further encouraged by the Bonn Challenge and the United Nations (UN) Decade on Ecosystem Restoration, which aim to spur global actions to prevent, halt and reverse the degradation of ecosystems.

Ecological restoration is a long-standing and highly organised practice with a dedicated international society, clear goals and a great deal of experience to draw from. The standard definition of restoration refers to the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed (Gann et al., 2019). As generally implemented, restoration is focused on actively restoring to the known or presumed state of a given ecosystem before degradation, and as a consequence tends to be costly (because, e.g., sites need to be prepared, species added, and management put in place; see e.g. Dietzel & Maes, 2015; Rohr et al., 2018) and implemented at a relatively small spatial scales (see e.g. Bellwood et al., 2019). In addition, in the face of rapid environmental change, restoration generally requires continual management to reach and maintain benchmark conditions (Bullock et al., 2022).

While restoration is enshrined in mainstream conservation and policy, as evidenced by the UN Decade on Ecosystem Restoration and the recently agreed Global Biodiversity Framework of the Convention on Biological Diversity, rewilding is being increasingly talked about as an alternative (and potentially cheaper) way to approach the large-scale recovery of nature, especially in the context of major land abandonment, climate change and the importance of top-down trophic interactions and associated trophic cascades for healthy ecosystem functioning (Svenning, 2020). Rewilding, broadly defined as facilitating the development of self-sustaining, self-organising and resilient ecosystems shaped by natural processes, is expected to differ from classical restoration in several ways: (i) rewilding aims for minimal to no ongoing management in the long term; (ii) it focuses on present and future ecosystem functioning and resilience, allowing the ecosystem to continually adapt and self-organise in response to environmental change and (iii) it has lower fidelity to taxonomic precedent and promotes taxonomic replacement for extinct native species that once underpinned the delivery of key ecological functions (du Toit & Pettorelli, 2019; Perino et al., 2019; Table 1). Rewilding thus encompasses, but is not limited to, natural regeneration, making it a related (in the case of passive restoration, sensu Atkinson & Bonser, 2020) yet distinct environmental management approach to restoration (du Toit & Pettorelli, 2019).

There, however, remain controversies around rewilding, with continuing discussion about what the goals of rewilding are, and how these are best achieved (Jørgensen, 2015; Schulte to Bühne, Pettorelli, et al., 2022). In addition, the literature on rewilding is heavily dominated by essays and opinion pieces, rather than empirical studies (Lorimer et al., 2015), leading to a limited availability of practical experience or hard science to draw from (but see, e.g., Schulte to Bühne, Ross, et al., 2022; Segar et al., 2022). Existing rewilding projects and associated information on changes in ecosystem trajectory tend to be relatively sparse and cover short time periods, with no matching sites acting as comparators or counterfactuals. By contrast, restoration boasts a rich research history, with good data on long-term outcomes (Crouzeilles et al., 2016), although practices could still be improved (Hobbs, 2018). Furthermore, while restoration aims to be replicable and built on methodologies that can be used in multiple locations to deliver consistent outcomes, rewilding is currently freer of such constraints, with little discussion around replicability in approaches.

With rewilding being a developing concept in ecosystem stewardship, scientific discussion has so far focused on highlighting the conceptual similarities and differences between restoration and rewilding practices (see e.g., Jepson, 2022; Svenning, 2020), particularly in the light of a call to drop the term altogether (Hayward et al., 2019). The complementary nature of these approaches has been previously alluded to (Anderson et al., 2019; Corlett, 2016a).

TABLE 1 A comparison of restoring and rewilding at the landscape scale, expressed in relation to a set of distinguishing attributes, adapted from du Toit and Pettorelli (2019).

Distinguishing attributes	Restoration	Rewilding
Relevance of historical benchmarks	Tends to be higher	Tends to be lower
Fidelity to taxonomic precedent	Tends to be higher	Tends to be lower
Predictability of system dynamics	Tends to be higher	Tends to be lower
Management commitment over time	Tends to be continuous	Aspires to be tapered
Motivation for translocations	Tends to be driven by species composition	Tends to be driven by functional type composition
Taxonomic replacement	Tend to be resisted	Tend to be accepted
Environmentally driven system transformation	Tends to be resisted	Tends to be accepted
Emergence of novel ecosystems	Tends to be resisted	Tends to be accepted
Costs per ha	Tends to be higher	Tends to be lower
Area considered for implementation	Tends to be smaller	Tends to be larger
Knowledge base	Higher	Lower

But potential synergies have rarely been explicitly discussed, even though the strategic combination of both approaches has the potential to transform the pace, costs and ecological outcomes of the large-scale recovery of nature needed to address societal challenges such as climate change and biodiversity loss. In this perspective, we aim to help the scientific, practitioner and policy communities interested in nature recovery to appreciate the benefits of integrating restoration and rewilding approaches. We then call on them to support the emergence of infrastructures and frameworks that facilitate the coordination and integration of the restoration and rewilding agendas. Such a step would not only benefit biodiversity but also support efforts to integrate different conservation strategies into whole landscape approaches (Kaltenborn & Linnell, 2022).

2 | RESTORATION AND REWILDING AS COMPLEMENTARY APPROACHES

Conserving and enhancing global biological diversity is not just about how best to manage a collection of life forms on Earth: it is also about promoting a diversity of interactions between these entities, which ultimately define ecosystems and their functionality (Noss, 1990). In a changing world, resilience of both the diversity and functioning of ecosystems is a third, critical component (Oliver et al., 2015). Promoting diversity, functionality and resilience are highly interdependent management aims that are each of key importance for securing the future of the natural world; these three aims, and their inter-dependencies, are all captured by management ambitions that focus on enhancing ecological complexity (Bullock et al., 2022). These three aims (diversity, functionality and resilience) are, however, addressed differently, yet complementarily, by restoration and rewilding.

Focusing on enhancing ecosystem functionality and resilience in degraded landscapes generally requires space, as these aims are facilitated by heterogeneity, trophic complexity that includes large herbivores and predators and connectivity (Oliver et al., 2015). Focusing on enhancing specific habitats or species populations, as restoration generally does, often requires significant intervention and long-term management and thus high levels of investment (Brancalion et al., 2019). Independently of the scenario considered, (i) conservation funding is always limited, (ii) the amount of degraded nature has been increasing steadily for the past decades and (iii) the costs of any management approach are directly linked to the size of the area considered, the level of intervention required and the length of time over which some form of management is required. As such, it is not surprising that conversations in conservation have increasingly focused on exploring what can be achieved at large spatial scales with limited budget.

Environmental approaches aiming for reduced levels of interventions will be relatively low budget in the long term compared with more active approaches carried out at the same spatial scale but can be risky. The more passive options that are more common in rewilding indeed often have inherent risks that may sometimes be more explicitly avoided by targeted restoration: these may include the loss of open habitat specialists due to natural regeneration of forests or soil loss and further degradation if wild vegetation cannot establish on abandoned fields due to dispersal or environmental constraints (Broughton et al., 2022; Corlett, 2016b; Navarro & Pereira, 2012). Rewilding leads to a high level of unpredictability in ecological outcomes with the associated risks that local communities will reject projects that are not guaranteed to meet their expectations (Pettorelli et al., 2018; Schulte to Bühne, Pettorelli, et al., 2022). Because of this, rewilding approaches are not possible everywhere, requiring specific environmental, societal and cultural contexts for them to be successfully accepted and implemented.

However, high-budget, management-heavy projects that aim at a high level of predictability in ecological outcomes by adhering to the restoration of historical benchmarks may also not be able to deliver on their promises everywhere on Earth. Failure to hit targets may arise because of the amounts of continuous funding needed to maintain restoration trajectories, unsuitability of local conditions for the restoration ambitions or even the acknowledged unpredictability of restoration outcomes (Brudvig et al., 2017). Such failures are likely to increase in the future because of climate change and its impacts on our ability to reconstruct communities based on historical benchmarks (Bullock et al., 2022; Pettorelli et al., 2021). Context, like biodiversity, is ultimately a multidimensional, evolving entity that underpins the success of any conservation project. Because contexts are diverse, developing a portfolio of approaches that target different scales and socio-ecological contexts and appeal to different communities is thus by far the best way to bend the curve on biodiversity loss.

3 | RESTORATION AND REWILDING AS SYNERGISTIC APPROACHES

Because they focus on different aspects of biodiversity (with restoration primarily putting the emphasis on species composition and rewilding on ecosystem functioning), there are several ways by which restoration and rewilding could work in synergy for the benefits of nature conservation (see also Pedersen et al., 2020; Van Meerbeek et al., 2019; Figure 1).

First, combined restoration and rewilding approaches could be used to create and kickstart a mosaic of successional habitats: specifically, traditional restoration approaches could be used to set different sites along different successional pathways, while the addition of rewilding sites intertwined with restoration sites could help ensure the overall landscape remains dynamic. Such a mixed approach would reduce the likelihood of conservation actions generating a static set of restored ‘habitat types’ over a landscape (Pywell et al., 2003), or conversely, a rewilded landscape that comprises a homogenous set of low-quality vegetation that develops very slowly (Navarro & Pereira, 2012; Figure 2).

Second, restoration efforts near rewilding sites could boost rewilding efficiency and benefits, by, for example, increasing

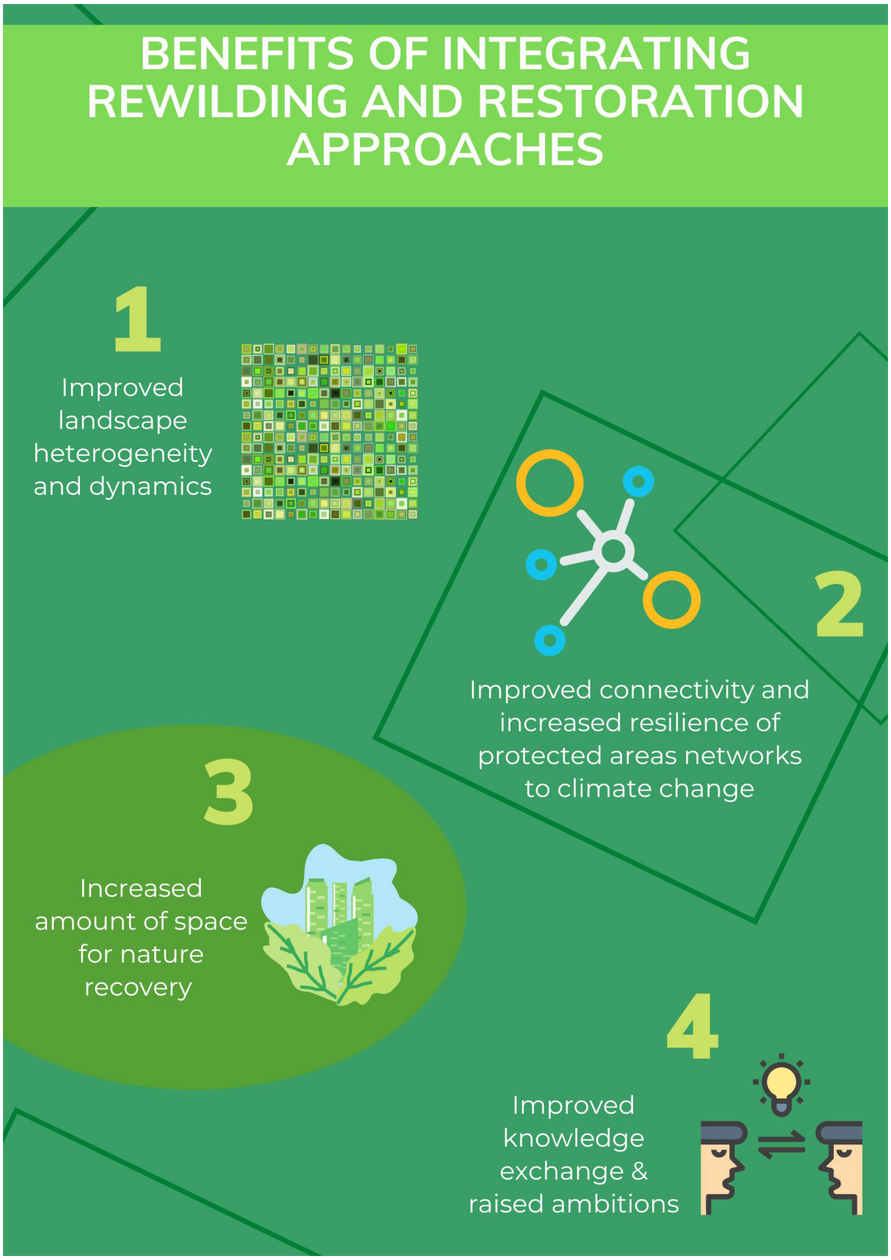

FIGURE 1 Synergies between restoration and rewilding.

opportunities of colonisation of rewilding sites by locally extinct species. The 'woodland islets' method—planting small blocks of trees in denuded landscapes, which can promote shrub and tree colonisation (Benayas et al., 2008)—is a specific, albeit small scale, example of such an approach. Such an approach could be particularly valuable in projects aiming to rewild farmed lands, such as Knepp (https://www.rewildingbritain.org.uk/rewilding-projects/knepp-castle-estate) or Mapperton (https://mappertonwildlands.com/), where restoration could help create a diversity of habitats and boost propagule production for natural regeneration on the rewilded land. Similarly, large-scale rewilding near and around restoration sites could 'soften' the landscape, making it more permeable and thus reducing isolation, which is a major cause of failure to meet restoration targets (Crouzeilles et al., 2016; Volk et al., 2018). The National Forest project in the UK (https://www.nationalforest.org/about/what-we-do), for example, currently focuses on active restoration. Combining these efforts with a rewilding approach (including for example the use of livestock or wild grazers, as is being trialled in the Forest of Blean https://www.kentwildlifetrust.org.uk/projects/wilder-blean) could increase the diversity of habitats in the landscape and therefore boost local biodiversity, while increasing the size of the recovered area.

Third, rewilding has undoubtedly stimulated public interest and debate in an unprecedented way (Schulte to Bühne, Pettorelli, et al., 2022), and a broader consideration of the complementarity of restoration and rewilding could boost overall nature recovery efforts, building on rewilding's popularity. This is particularly true for urban ecosystems, which are structurally complex and highly heterogeneous fine-scale spatial mosaics of interconnected and diverse patch types that include elements of different sizes, such as small woodland areas,

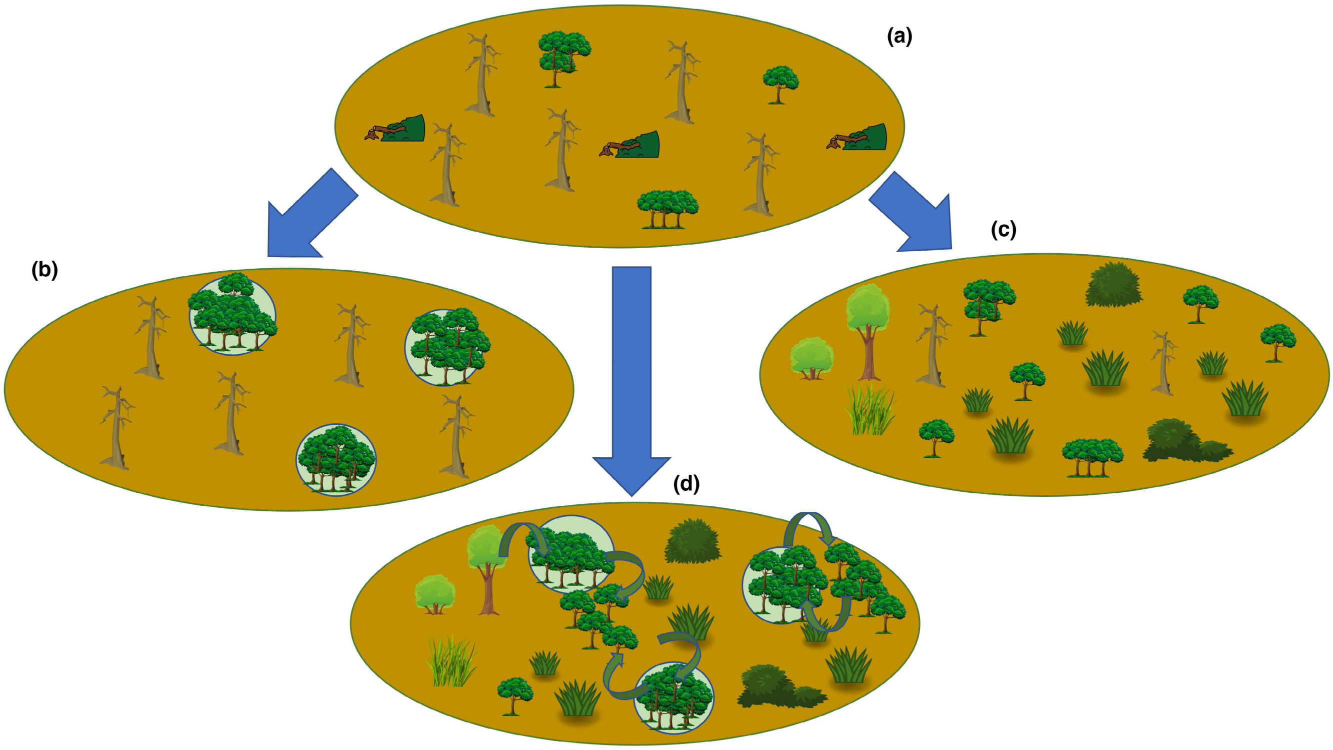

FIGURE 2 Hypothetical scenario comparing the outcomes of restoration (b), rewilding (c) and rewilding with restoration (d) in an expansive forested landscape where biodiversity and biogeochemical and biophysical processes have been degraded (a). In (b), restoration is being used to recover biodiversity in patches where intensive land management and reintroductions are concentrated; in (c), a rewilding approach is being considered across the whole landscape. Under (d), restoring and rewilding approaches are both applied simultaneously side-by-side in a mixed strategy to achieve cost-saving and ecological synergy. The matrix surrounding the restoration patches is where rewilding (either active or passive) is promoted to improve ecosystem functioning. Assuming no major problems with interspecific competition or predation between patch and matrix community members, the restoration patches can act as sources of (re)colonisers for the matrix, with species expected to have an increased chance of becoming established as ecosystem functioning improves in the matrix. If the restoration efforts prove too expensive or simply futile, the matrix could quickly subsume the patches and the overall goal could shift seamlessly from restoring to rewilding.

patches of grass, water bodies, gardens and allotments. Some of these patches might lend themselves well to restoration practices, but for others, the open-ended, passive management approach of rewilding may be more realistic. Rewilding may indeed open up opportunities for nature recovery in sites previously neglected by restoration efforts, such as large private gardens, unused tracks and railway verges and city parks (Lehmann, 2021). Strategic urban planning that combines the use of restoration and rewilding has thus the potential to significantly boost biodiversity in cities, by increasing the proportion of vegetated areas, enhancing functional connectivity and supporting the emergence of novel community assemblages that may develop as a result of the integration of exotic species and species' redistribution in response to climate change (Pettorelli et al., 2022). Importantly, urban rewilding provides opportunities to engage residents in conservation efforts (Lehmann, 2021), which could trigger broader support for, and engagement with, local restoration projects, ultimately raising overall nature recovery ambitions.

Fourth, better coordination and dialogue between the restoration and rewilding communities could help the rewilding community draw a lot of knowledge from the restoration community, which could help build the 'know how' quicker and more efficiently. Such a closer connection could also invigorate and rejuvenate the restoration community, with rewilding providing inspiration for restoration efforts to be bolder and go bigger in terms of scale, and for starting healthy discussions around restoration for enhancing the functioning and ecological complexity of ecosystems under global change (Bullock et al., 2022; du Toit & Pettorelli, 2019; Pettorelli et al., 2021).

Taken together, better coordination between restoration and rewilding efforts could thus enhance efforts to boost overall landscape connectivity, for the benefits of biodiversity and ecological functioning (Perino et al., 2019; Thierry & Rogers, 2020). This is particularly important in the context of climate change, as well as being very relevant to achieving the targets defined under the Global Biodiversity Framework agreed at 15th Conference of the Parties (COP 15) of the UN Convention on Biological Diversity (see e.g., Carroll & Noss, 2021). Ensuring high levels of connectivity in protected areas' networks is indeed for example key to guaranteeing protected areas' effectiveness in terms of biological diversity conservation in times of rapid climatic changes. To secure high levels of connectivity among local biodiversity hotspots (should they be protected or not) within given landscapes requires coordination among all stakeholders involved in environmental management and wildlife conservation and concerted efforts to prioritise connectivity considerations in future restoration and rewilding project plans.

4 | CONCLUSIONS

Nature is a formidable ally in tackling the pressing environmental and societal challenges of our times, such as the current breakdown of our climate, but only if it can be allowed to recover at scale. Restoration and rewilding are both relevant in efforts to enhance global biodiversity and stabilise our climate but are anchored in different visions; target-driven versus open-ended, respectively. This diversity in vision could be a strength when it comes to wildlife conservation in times of large-scale nature recovery needs, limited budgets and rapidly changing climatic conditions, rather than a problem or a source of discord. Developing approaches that promote and factor in synergies between restoration and rewilding could lead to a step change in adopting a landscape perspective when designing nature recovery interventions. This would help contextualise proposed local actions in terms of likely nature benefits for entire regions.

To ensure that benefits of potential synergies can be reaped, the restoration and rewilding communities need to come together, inform each other, and develop a shared agenda supporting the emergence of resilient, effective, nature-based solutions (Jepson, 2022). Indeed, there is some progress in this direction. For example, it has been argued that rewilding projects could implement adaptive management approaches by monitoring developments and adjusting rewilding interventions in order to 'nudge' ecosystems towards desired trajectories (e.g., forest rather than savannah, or vice versa) (Perino et al., 2019). Conversely, it has been suggested that restoration moves on from the target of recreating specific communities, to aim rather at creating complex systems that are resilient to global change (Bullock et al., 2022). These two examples illustrate potential benefits of rewilding adopting some restoration approaches and vice versa.

A successful integration of the restoration and rewilding agendas that fully takes advantage of the complementarity and synergies of these approaches, however, requires more than scientific alignment; it also need policy support and coordination. Yet there is still limited explicit reference to rewilding in much international and national legislation to date (Cretois et al., 2019), with, for example, no explicit reference to rewilding in the European Union biodiversity strategy to 2030, the proposed European Nature Restoration Law or the post-2020 Global Biodiversity Framework. Admittedly, agreeing on an operational definition of rewilding would facilitate the integration of rewilding in national and international legislation, which is why, for example, the International Union for Conservation of Nature (IUCN) sat up in 2021 an IUCN-wide Rewilding working group charged with the production of a definition, associated principles and guidelines for rewilding (https://iucn-rwg.org/). That said, the level of scientific consensus on rewilding has grown substantially over the past few years, with organisations such as the Global Rewilding Alliance supporting the emergence of a coordinated voice from the rewilding community. Rewilding is now being mentioned in calls from major conservation funders (such as Biodiversa+ and the European Union's Horizon programmes), and countries such as England have brought forward policies to pay farmers for rewilding landscapes. As such, the time is right for major UN policy platforms and international funding agencies to start facilitating the coordination and integration of the rewilding and restoration agendas.

AUTHOR CONTRIBUTIONS

Nathalie Pettorelli and James M. Bullock conceived the ideas for this manuscript. Nathalie Pettorelli led the writing of this contribution. Both authors contributed critically to the drafts and gave final approval for publication.

ACKNOWLEDGEMENTS

NP is funded by Research England, and JMB under UKCEH National Capability project 06895 and NERC consortium award 'Restoring Resilient Ecosystems' NE/V006525/1.

CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to report.

DATA AVAILABILITY STATEMENT

No data were used in this contribution.

ORCID

Nathalie Pettorelli https://orcid.org/0000-0002-1594-6208
James M. Bullock https://orcid.org/0000-0003-0529-4020

REFERENCES

Anderson, R. M., Buitenwerf, R., Driessen, C., Genes, L., Lorimer, J., & Svenning, J. C. (2019). Introducing rewilding to restoration to expand the conservation effort: A response to Hayward et al. *Biodiversity and Conservation*, *28*, 3691–3693.

Atkinson, J., & Bonser, S. P. (2020). 'Active' and 'passive' ecological restoration strategies in meta-analysis. *Restoration Ecology*, *28*, 1032–1035.

Bellwood, D. R., Pratchett, M. S., Morrison, T. H., Gurney, G. G., Hughes, T. P., Álvarez-Romero, J. G., Day, J. C., Grantham, R., Grech, A., Hoey, A. S., Jones, G. P., Pandolfi, J. M., Tebbett, S. B., Techera, E., Weeks, R., & Cumming, G. S. (2019). Coral reef conservation in the Anthropocene: Confronting spatial mismatches and prioritizing functions. *Biological Conservation*, *236*, 604–615.

Benayas, J. M. R., Bullock, J. M., & Newton, A. C. (2008). Creating woodland islets to reconcile ecological restoration, conservation, and agricultural land use. *Frontiers in Ecology and the Environment*, *6*, 329–336.

Brancalion, P. H. S., Meli, P., Tymus, J. R. C., Lenti, F. E. B., M. Benini, R., Silva, A. P. M., Isernhagen, I., & Holl, K. D. (2019). What makes ecosystem restoration expensive? A systematic cost assessment of projects in Brazil. *Biological Conservation*, *240*, 108274.

Broughton, R. K., Bullock, J. M., George, C., Gerard, F., Maziarz, M., Payne, W. E., Scholefield, P. A., Wade, D., & Pywell, R. F. (2022). Slow development of woodland vegetation and bird communities during 33 years of passive rewilding in open farmland. *PLoS ONE*, *17*, e0277545.

Brudvig, L. A., Barak, R. S., Bauer, J. T., Caughlin, T. T., Laughlin, D. C., Larios, L., Matthews, J. W., Stuble, K. L., Turley, N. E., & Zirbel, C.

R. (2017). Interpreting variation to advance predictive restoration science. *Journal of Applied Ecology*, *54*, 1018–1027.
Bullock, J. M. E., Fuentes-Montemayor, E., McCarthy, B., Park, K., Hails, R. S., Woodcock, B. A., Watts, K., Corstanje, R., & Harris, J. (2022). Future restoration should enhance ecological complexity and emergent properties at multiple scales. *Ecography*, *4*. https://doi.org/10.1111/ecog.05780
Carroll, C., & Noss, R. F. (2021). Rewilding in the face of climate change. *Conservation Biology*, *35*, 155–167.
Corlett, R. T. (2016a). Restoration, reintroduction, and rewilding in a changing world. *Trends in Ecology & Evolution*, *31*, 453–462.
Corlett, R. T. (2016b). The role of rewilding in landscape design for conservation. *Current Landscape Ecology Reports*, *1*, 127–133.
Cretois, B., Linnell, J. D., Kaltenborn, B. P., & Trouwborst, A. (2019). What form of human-wildlife coexistence is mandated by legislation? A comparative analysis of international and national instruments. *Biodiversity and Conservation*, *28*, 1729–1741.
Crouzeilles, R., Curran, M., Ferreira, M. S., Lindenmayer, D. B., Grelle, C. E. V., & Rey Benayas, J. M. (2016). A global meta-analysis on the ecological drivers of forest restoration success. *Nature Communications*, *7*, 11666.
Dietzel, A., & Maes, J. (2015). *Costs of restoration measures in the EU based on an assessment of LIFE projects*. EUR 27494. Publications Office of the European Union, JRC97635.
du Toit, J., & Pettorelli, N. (2019). The differences between rewilding and restoring an ecologically degraded landscape. *Journal of Applied Ecology*, *56*, 2467–2471.
Gann, G. D., McDonald, T., Walder, B., Aronson, J., Nelson, C. R., Jonson, J., Hallett, J. G., Eisenberg, C., Guariguata, M. R., Liu, J., Hua, F., Echeverría, C., Gonzales, E., Shaw, N., Decleer, K., & Dixon, K. W. (2019). International principles and standards for the practice of ecological restoration. Second edition. *Restoration Ecology*, *27*, S1–S46.
Hayward, M. W., Scanlon, R. J., Callen, A., Howell, L. G., Klop-Toker, K. L., di Blanco, Y., Balkenhol, N., Bugir, C. K., Campbell, L., Caravaggi, A., Chalmers, A. C., Clulow, J., Clulow, S., Cross, P., Gould, J. A., Griffin, A. S., Heurich, M., Howe, B. K., Jachowski, D. S., … Weise, F. J. (2019). Reintroducing rewilding to restoration—Rejecting the search for novelty. *Biological Conservation*, *233*, 255–259.
Hobbs, R. J. (2018). Restoration Ecology's silver jubilee: Innovation, debate, and creating a future for restoration ecology. *Restoration Ecology*, *26*, 801–805.
Jepson, P. R. (2022). To capitalise on the Decade of Ecosystem Restoration, we need institutional redesign to empower advances in restoration ecology and rewilding. *People and Nature*, *4*, 1404–1413. https://doi.org/10.1002/pan3.10320
Jørgensen, D. (2015). Rethinking rewilding. *Geoforum*, *65*, 482–488.
Kaltenborn, B. P., & Linnell, J. D. C. (2022). The coexistence potential of different wildlife conservation frameworks in a historical perspective. *Frontiers in Conservation Science*, *2*. https://doi.org/10.3389/fcosc.2021.711480
Lehmann, S. (2021). Growing biodiverse urban futures: Renaturalization and rewilding as strategies to strengthen urban resilience. *Sustainability*, *13*, 2932.
Lorimer, J., Sandom, C., Jepson, P., Doughty, C., Barua, M., & Kirby, K. J. (2015). Rewilding: Science, practice, and politics. *Annual Review of Environment and Resources*, *40*, 39–62.
Navarro, L. M., & Pereira, H. M. (2012). Rewilding abandoned landscapes in Europe. *Ecosystems*, *15*, 900–912.
Noss, R. F. (1990). Indicators for monitoring biodiversity: A hierarchical approach. *Conservation Biology*, *4*, 355–364.
Oliver, T. H., Heard, M. S., Isaac, N. J. B., Roy, D. B., Procter, D., Eigenbrod, F., Freckleton, R., Hector, A., Orme, C. D. L., Petchey, O. L., Proença, V., Raffaelli, D., Suttle, K. B., Mace, G. M., Martín-López, B., Woodcock, B. A., & Bullock, J. M. (2015). Biodiversity and resilience of ecosystem functions. *Trends in Ecology & Evolution*, *30*, 673–684.
Pedersen, P. B. M., Ejrnæs, R., Sandel, B., & Svenning, J.-C. (2020). Trophic Rewilding Advancement in Anthropogenically Impacted Landscapes (TRAAIL): A framework to link conventional conservation management and rewilding. *Ambio*, *49*, 231–244.
Perino, A., Pereira, H. M., Navarro, L. M., Fernández, N., Bullock, J. M., Ceaușu, S., Cortés-Avizanda, A., van Klink, R., Kuemmerle, T., Lomba, A., Pe'er, G., Plieninger, T., Rey Benayas, J. M., Sandom, C. J., Svenning, J. C., & Wheeler, H. C. (2019). Rewilding complex ecosystems. *Science*, *364*, 5570.
Pettorelli, N., Barlow, J., Stephens, P. A., Durant, S. M., Connor, B., Schulte to Bühne, H., Sandom, C. J., Wentworth, J., & du Toit, J. T. (2018). Making rewilding fit for policy. *Journal of Applied Ecology*, *55*, 1114–1125.
Pettorelli, N., Graham, N. A. J., Seddon, N., Maria da Cunha Bustamante, M., Lowton, M. J., Sutherland, W. J., Koldewey, H. J., Prentice, H. C., & Barlow, J. (2021). Time to integrate global climate change and biodiversity science-policy agendas. *Journal of Applied Ecology*, *58*, 2384–2393.
Pettorelli, N., Schulte to Bühne, H., Cunningham, A. A., Dancer, A., Debney, A., Durant, S. M., Hoffmann, M., Laughlin, B., Pilkington, J., Pecorelli, J., Seiffert, S., Shadbolt, T., & Terry, A. (2022). *Rewilding our cities*. ZSL Report. https://issuu.com/zoologicalsocietyoflondon/docs/zsl_rewilding_our_cities_report
Pywell, R. F., Bullock, J. M., Roy, D. B., Warman, L. I. Z., Walker, K. J., & Rothery, P. (2003). Plant traits as predictors of performance in ecological restoration. *Journal of Applied Ecology*, *40*, 65–77.
Rohr, J. R., Bernhardt, E., Cadotte, M. W., & Clements, W. (2018). The ecology and economics of restoration: When, what, where, and how to restore ecosystems. *Ecology and Society*, *23*, 15.
Schulte to Bühne, H., Pettorelli, N., & Hoffmann, M. (2022). The policy consequences of defining rewilding. *Ambio*, *51*, 93–102.
Schulte to Bühne, H., Ross, B., Sandom, C. J., & Pettorelli, N. (2022). Monitoring rewilding from space: The Knepp estate as a case study. *Journal of Environmental Management*, *312*, 114867.
Segar, J., Pereira, H. M., Filgueiras, R., Karamanlidis, A. A., Saavedra, D., & Fernández, N. (2022). Expert-based assessment of rewilding indicates progress at site-level, yet challenges for upscaling. *Ecography*, *4*, e05836.
Strassburg, B. B. N., Iribarrem, A., Beyer, H. L., Cordeiro, C. L., Crouzeilles, R., Jakovac, C. C., Braga Junqueira, A., Lacerda, E., Latawiec, A. E., Balmford, A., Brooks, T. M., Butchart, S. H. M., Chazdon, R. L., Erb, K. H., Brancalion, P., Buchanan, G., Cooper, D., Díaz, S., Donald, P. F., … Visconti, P. (2020). Global priority areas for ecosystem restoration. *Nature*, *586*, 724–729.
Svenning, J. C. (2020). Rewilding should be central to global restoration efforts. *One Earth*, *3*, 657–660.
Thierry, H., & Rogers, H. (2020). Where to rewild? A conceptual framework to spatially optimize ecological function. *Proceedings of the Royal Society B: Biological Sciences*, *287*, 20193017.
Van Meerbeek, K., Muys, B., Schowanek, S. D., & Svenning, J.-C. (2019). Reconciling conflicting paradigms of biodiversity conservation: Human intervention and rewilding. *BioScience*, *69*, 997–1007.
Volk, X. K., Gattringer, J. P., Otte, A., & Harvolk-Schoning, S. (2018). Connectivity analysis as a tool for assessing restoration success. *Landscape Ecology*, *33*, 371–387.

How to cite this article: Pettorelli, N., & Bullock, J. M. (2023). Restore or rewild? Implementing complementary approaches to bend the curve on biodiversity loss. *Ecological Solutions and Evidence*, *4*, e12244. https://doi.org/10.1002/2688-8319.12244