The need for an evidence-led approach to rewilding

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ABSTRACT

This paper characterises current rewilding activities in the UK, through the analysis of 66 rewilding projects. Project information was obtained from online data (65%), and direct mail data requests (35%). The analyses showed an exponential growth in the number of new rewilding projects since 2010, with 8% of projects started prior to 2000, and 60% initiated after 2010. Seventy-three percent of projects involved rewilding areas of less than 1000 hectares, 17% being between 1000 and 10,000 hectares, and 9% greater than 10,000 hectares. In Scotland, 80% of the area being rewilded involved mountain, heath and bog habitats. For England the largest rewilded areas (58%) were semi-natural or improved grasslands. Fifty-six percent of sites were formerly used for livestock farming, and 24% for arable cultivation. A total of 72% of sites employed tree planting, 64% introduced herbivores, and 33% introduced non-herbivores. The removal of sheep and cattle took place in 51% of projects, with deer control in 33%, wetland creation in 39%, and the removal of artificial drainage in 36% of projects. There was a close geographical proximity between rewilding sites and Sites of Special Scientific Interest (SSSI), with 69% of areas being within 4km, and only two sites greater than 8km. Twelve project funding sources were recorded, and most projects utilised multiple funding sources. The benefits of an evidence-led and nationally co-ordinated rewilding approach were identified in relation to using well-established decision tools and frameworks to enhance future rewilding spatial planning. This would allow the development of a map of 'appropriate' rewilding areas, based on landscape scale characteristics, national species and habitat priorities, and predicted future landscape changes. Importantly, these 'target' areas would also be sensitive to local social, economic and agricultural contexts.

KEY WORDS

Rewilding. Characterisation. Evidence-led. Decision tools. Enabling.

INTRODUCTION

The definition, purpose, utility and approaches associated with the concept of 'rewilding', have been comprehensively debated and discussed across the published literature (Corlett 2016; Hayward *et al*. 2019; Nogués-Bravo *et al*. 2016; Jepson and Schepers 2016; Jørgensen 2015; Segar *et al*., 2021; Thierry

and Rogers 2020; Wynne-Jones *et al*. 2020). Broadly, the core purpose of rewilding is to implement working practices that support the transition of landscape-scale ecosystems to a more self-sustaining state (Driver 2022; Thierry and Rogers 2020). This long-term goal is often achieved through species reintroduction programmes, and the gradual move toward more passive, 'hands-off' management regimes. Importantly, rewilding is now conceived to be a 'complementary' approach to more traditional actions to protect, conserve and manage sites and landscapes i.e. it is intended to ensure the aims of traditional site- and species-based actions are nested within attempts to improve the ecosystem functioning of wider landscapes (Driver 2022; Lawton 2010). Debates within the conservation sector on the rewilding approach, have often been surprisingly vehement and polarised, and this has led to an evolution and general broadening of the concept (Thomas 2022). However, such debates within the science and conservation practitioner communities, have been pivotal in developing an accepted terminology and focus for rewilding, and ensuring concept clarity for stakeholders, local communities, policy makers, and potential funders. It has also been argued that the term rewilding has injected a much-needed source of understanding and support for conservation action and policy amongst the wider public (Hayward *et al.* 2019).

In the UK, there are currently a broad number of active conservation projects that have been nominally labelled as rewilding. Despite this, some authors have questioned whether the UK is an appropriate location for rewilding (Wynne-Jones *et al*. 2020). The UK is a highly nature-depleted country, as a result of a combination of high human population density, non-sustainable resource use, the historical intensification of agricultural systems, the widespread influence of introduced and invasive species, and the absence of higher trophic and keystone species (Maron *et al.* 2020; Taylor 2005; Wynne-Jones *et al*. 2020). The move towards rewilding has also been questioned in relation to the difficulty with developing methods to detect and measure biodiversity gains resulting from rewilding activities. It will also require considerable additional research to develop methods that allow taxa level 'gains' to be allocated to specific practices within a broad suite of actions at a landscape scale (Segar *et al*., 2021). Furthermore, at this early stage in the implementation of rewilding projects across the UK, it is premature to undertake evaluative meta-analyses and develop best-practice guidance (Hart *et al.*, 2023). Most of the activity in this area is therefore currently either based on 'local' knowledge within participating organisations, or information derived from previous habitat restoration projects published within the scientific and grey literature (Chang and Todd 2023; Loch *et al.* 2020; Genes and Dirzo 2022). There have also been some attempts to collate the views of rewilding 'experts' to derive broad rewilding principals for adoption across all rewilding initiatives (see: IUCN 2017; Carver *et al.* 2021)

Despite a considerable increase in rewilding activity over the last decade, the transition to rewilding approaches suffers from a range of methodological, funding and implementation issues (Cordingley *et al.* 2016; Donaldson *et al.* 2017). A major element of this is that the number and diversity of stakeholder groups and local communities increases as conservation approaches are re-focused from site-based actions to larger landscape scales. This increases the overall complexity of projects and decreases the probability of consensus across both key and peripheral players and communities. Whilst many conservation organisations have historically been very clear about what they don't want an environment to look like or contain, the development of a wider common vision for the future (aligned with public, business and political views), is harder to articulate and agree upon. This is particularly the case when working at larger scale, and requires the accommodation of often opposing cross-sectoral views, goals and practices (Friedman *et al.* 2022; Smith *et al.* 2022). In the past, even traditional small-scale, site-based approaches have proved difficult for conservation organisations to maintain both in terms of funding and capacity (O'Connell *et al*. 2017). In practice, many NGOs have nominally transitioned into 'landscape-scale' organisations, but have found it difficult to achieve desired outcomes beyond the boundaries of their original management sites (McGonigle *et al.* 2020; Pressey and Bottrill 2009; Selman 2006). The 'step up' to becoming a rewilding organisation is thus likely to have a range of associated issues for many conservation organisations and private land owners.

Despite growing interest in the process and outcomes of rewilding, there is currently no national-level strategic vision for the approach in the UK. In other words, the development of new projects is largely *ad hoc*, and is principally driven by the activities of local enthusiasts and land owners who are keen to increase site biodiversity and 'naturalness'. The development of new sites is therefore does not appear to be related to, for example, nationally important and priority species/habitats, enhancing landscapes for protected areas networks, or as a means for biodiversity net gain. Nor is there integration with the broad range of landscape-scale approaches undertaken by conservation organisations and the statutory agencies e.g. Nature Recovery Zones (NRZs), Local Nature Recovery Strategies (LNRS), or reporting for international conventions. Nor are there common standards of implementation, or developed metrics of 'success' for rewilding sites (Root-Bernstein, 2022; Hart *et al.*, 2023). As a starting point to moving towards a more evidence-led and nationally strategic approach to rewilding, there is a need to understand and quantify what is *currently* being undertaken. This paper therefore has two broad aims. First, a sample of UK rewilding projects is used to understand the types of current rewilding actions across the UK. This is particularly in relation to the focal habitats involved, and the range of intervention types being used. Second, the benefits of a more evidence-led and

nationally co-ordinated rewilding approach are discussed, particularly in the context of using available decision tools to support spatial planning and conservation actions.

METHODS

Internet searches were conducted for information on terrestrial rewilding projects within the UK. Gleaned data were collated in relation to project location and start date, the size of the rewilding area, and the type of interventions being undertaken. For these projects, the data available on the internet were supplemented by direct (emailed) requests for information from 66 managers of rewilding projects. The managers were asked to supply digital maps of the site, to elaborate on the over-arching aim of their initiative, and to provide information on the broad methods being adopted. Where possible, spatial data for the rewilding sites (location points and area polygons), were captured using QGIS (QGIS.org, 2022). Land cover data and habitat classifications were obtained from the Centre for Ecology and Hydrology's Land Cover Map 2020 (Morton *et al.*, 2021), and used to assess land types associated with the rewilding projects. Collated projects were classified by type (conservation, ecological, passive, Pleistocene, restoration) using Corlett (2016), and the following information collated: (1) trends in the number of new projects with time, (2) the frequency distribution of the area of projects, (3) the total area of habitat type across all projects, (4) the number of rewilding projects in which each habitat type is present, (5) the previous management focus at the rewilding site, (6) the type of rewilding interventions being implemented, (7) the distance to designated site, and (8) funding sources.

RESULTS

Data were obtained for a total of 66 rewilding initiatives across England, Scotland and Wales (Figure 1). No project information was available from Northern Ireland. Of these 66 projects, information for 43 (65%) were obtained from available online data, and 23 (35%) were assessed using information provided in response to an email data request.

Figure 1. Location of the 66 rewilding projects for which information was collated.

Information across all variables was not available for all 66 sites. The sample sizes of the variables collected are shown in Table 1.

Site information	Total	England	Wales	Scotland
All	66	42	5	19
Start Date	61	39	3	19
Project Area	63	41	3	19
Current Habitat	35	22	0	13
Previous Management	54	37	1	16
Rewilding Interventions	61	39	3	19
Distance to Designated site	66	42	5	19
Funding	14	5	1	8

Table 1. Samples sizes for collated rewilding site information.

The initiation (start date) of new rewilding projects between 1985 and 2020, is shown in Figure 2. There has been an exponential growth in the number of new projects in the last decade, with only 5 (8%) of projects started prior to 2000. Thirty-nine of the projects (60%) were initiated after 2010.

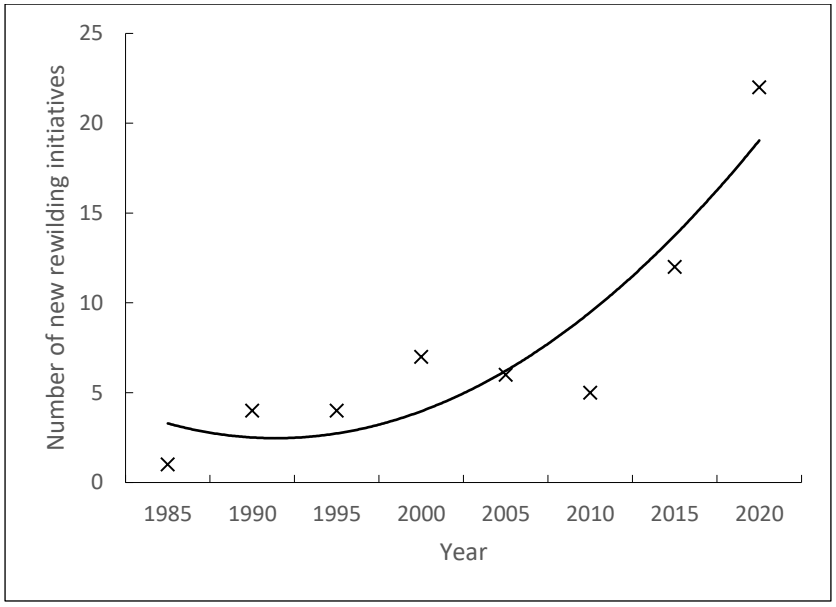

Figure 2. Initiation time of new rewilding projects 1985 to 2020.

No information on project area (hectares of land being rewilded), was available for Northern Ireland Only three sites in Wales had area data available. However, these lacked suitable site habitat data and were not used in the area analyses. When considering all evaluated projects, the majority (73%) involved rewilding areas of less than 1,000 hectares (mean=318ha ±40, n=46, range = 4 to 951ha) (Figure 3). There were some larger scale sites, with 11 (17%) being between 1000 and 10,000 hectares, and 6 (9%) being greater than 10,000 hectares. Figure 3 also shows the areas of different habitat types being rewilded. In Scotland, nearly 80% of the area being rewilded involved mountain, heath and bog habitats. For England the largest areas were grasslands, either semi-natural or improved.

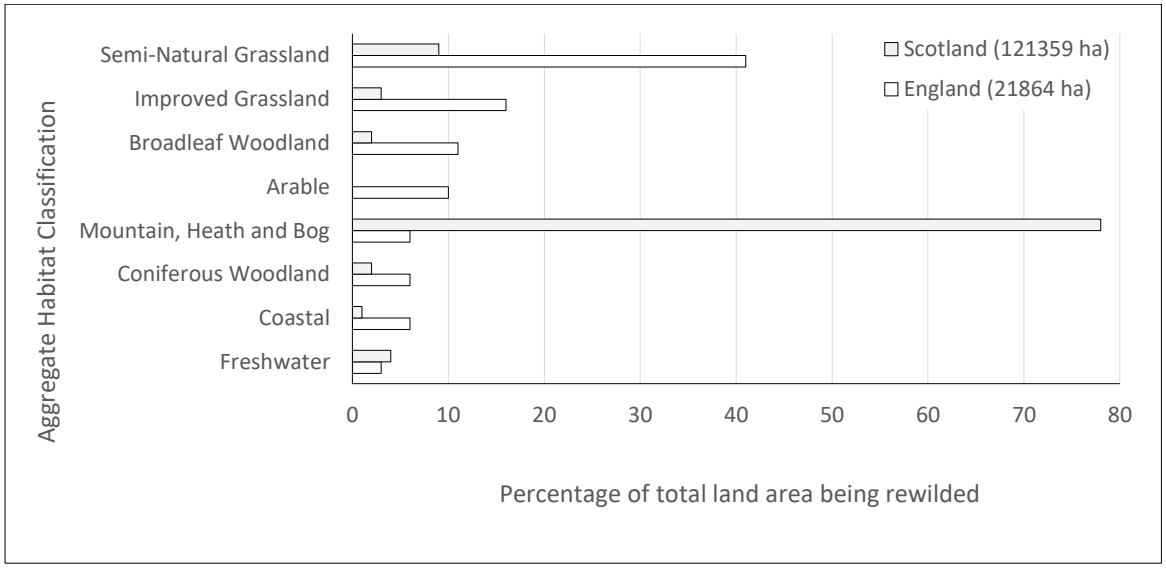

Figure 3. Total area and percentage of habitat types being rewilded in Scotland and England 1985 to 2020 (n=35).

The primary land use type prior to the initiation of rewilding projects is shown in Figure 4. Thirty sites (56%) were previously used for livestock (sheep, pigs, cattle). However, there was no information on whether the rewilding projects immediately changed the land use, or if the sites had been out of commercial use (fallow) for some years. This was the same for the 13 (24%) projects that were sited on land formerly used for arable cultivation. The result for grouse moors (4%) requires more data, as a number of large Scottish rewilding projects may have involved this type of change in land use.

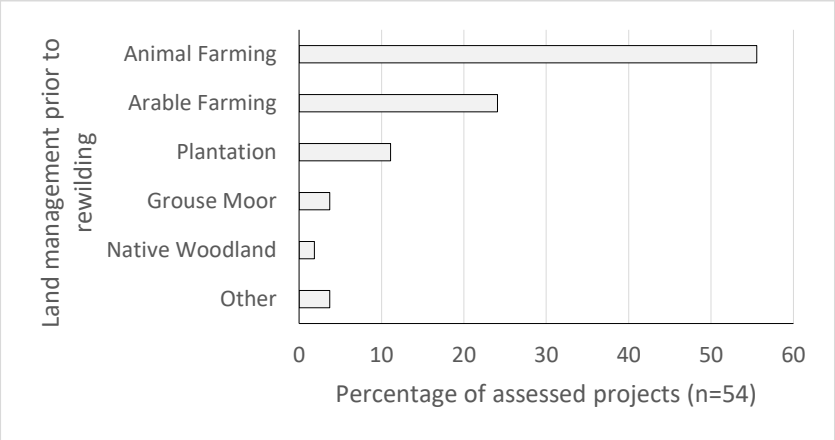

Figure 4. Change in land use for sites being rewilded (n=54).

The range of interventions being implemented as part of rewilding projects (n=61) is shown in Figure 5. Projects were divided into those that involve some type of intervention addition or removal, or a combination of both. For projects involving addition, 72% employed tree planting. Species introduction was also an important intervention with 64% of projects introducing herbivores, and 33% introducing non-herbivores. From the data, it was not possible to discern between those that were 'new' introductions and those that were re-introduction of formally present specie at a site. This needs some further clarification, as the removal of sheep and cattle also took place in more than half the projects assessed (51%), and deer control in 33% of projects. Wetland creation was a rewilding element of 39% of projects, and the removal of artificial drainage was used in 36% of projects.

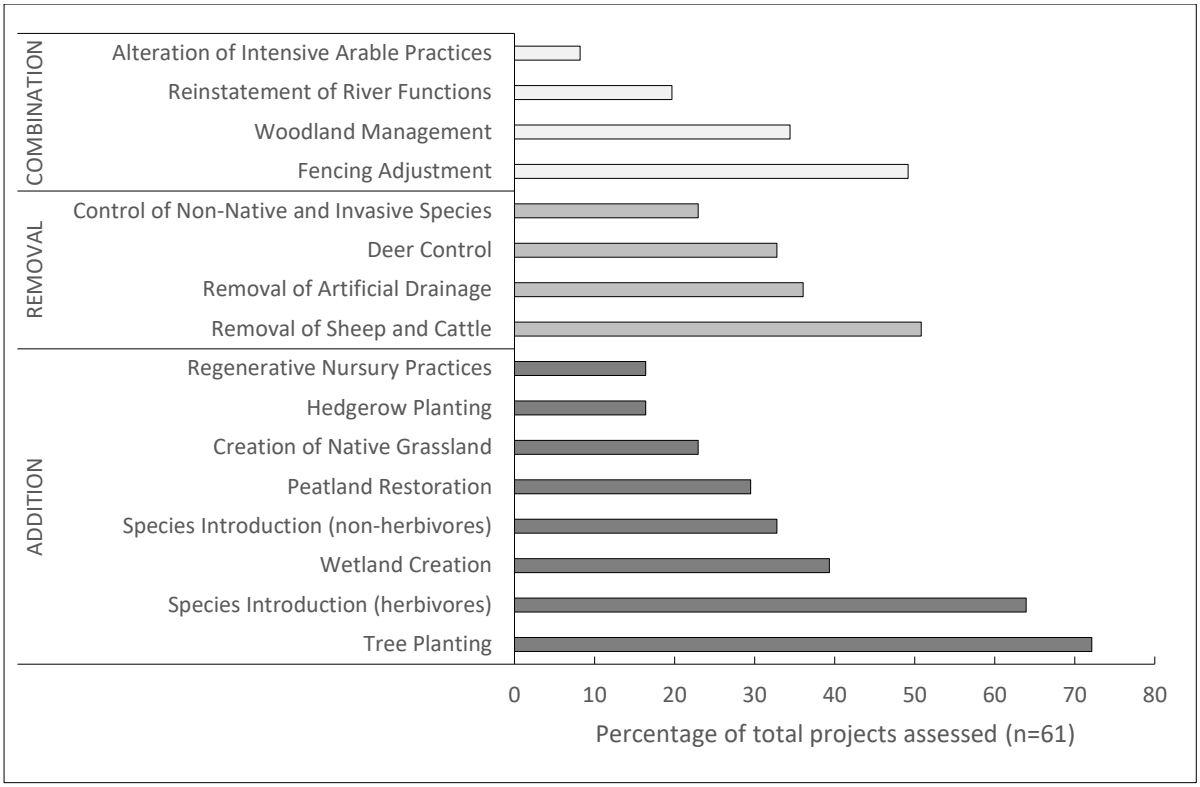

Figure 5. Types of interventions being implemented in rewilding projects (n=61).

There was a close geographical proximity of designated Sites of Special Scientific Interest (SSSI) to all the rewilding projects assessed. Forty-six (69%) of the projects were less than 4km from a SSSI (Figure 6). Only 2 sites (3%) were greater than 8km from a SSSI.

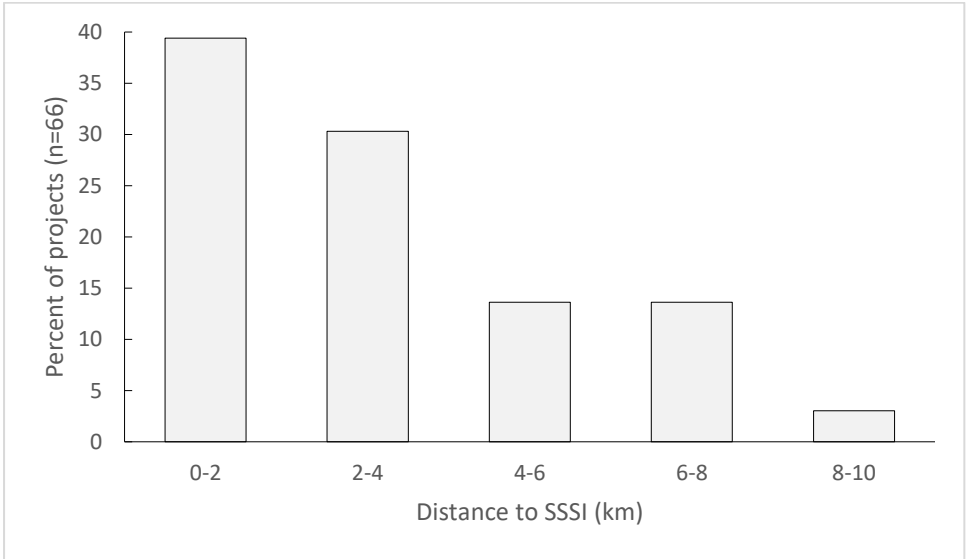

Figure 6. Distance of rewilding projects to designated sites of special scientific interest (n=61).

Information about funding sources was publicly available for only 14 (21%) of the 66 rewilding projects assessed, and this referred only to the source, not the amount of funding. Twelve different core funding types were recorded (**Table 2**) and most projects utilised multiple funding sources.

CATEGORY	FUNDING SOURCE	PROJECTS
Agricultural Income	Farming	1
Agri-environment Schemes	Countryside Stewardship Scheme	1
Carbon Offset Provider	Forest Carbon	1
Charities	John Muir Trust	3
	Esmee Fairburn Foundation	2
	Garfield Weston Foundation	2
	Carman Family Foundation	1
	RSPB	1
	The Reece Foundation	1
	The Wildlife Trusts	1
	Trees for Life	1
	Woodland Trust	1
Direct Public Fundraising	Community Fundraising	1
	Public Appeal	1
Eco-tourism	Eco-tourism	1
EU Funding	European Agricultural Fund for Rural Development	2
Event Income	Weddings, rentals, retreats, etc.	2
Government Agencies	Nature Scot	2
	Scottish Environmental Protection Agency	1
	Scottish Forestry	1
	Scottish Government	1
	Welsh Government	1
Lottery Funding	Lottery Fund	4
	Scottish Land Fund	1
Private Donations	Personal Bequest	1
Other	One Tree Planted	1
	Wood Fuel Co-operative	1
	South of Scotland Enterprise	1

Table 2. Funding sources for rewilding projects (n=14).

DISCUSSION

The internet searches conducted for this review, suggest a number of 'hidden' ongoing rewilding initiatives i.e. those that may be mentioned by name, but that have no publicly available information in relation to their nature, scale and goals. Nevertheless, we believe that the collated sample presented here represents a broad characterisation of what is currently being attempted across the UK. Our results suggest that the number of projects has increased exponentially since 2010, although the average area of new projects hasn't increased. This surge in new projects has coincided with

efforts to coordinate actions between rewilding organisations, and to support new multi-partner projects (Jones and Comfort, 2020). For example, the charity *Rewilding Britain* was established in 2015, specifically to champion rewilding projects and catalyse both debate and action (Rewilding Britain, nd). There is a similar organisation for European rewilding groups (Rewilding Europe, 2021). Both of these networks have articulated a 'vision' for future landscapes, with over-arching goals they wish to achieve. For example, *Rewilding Britain* has a mission is to see "*…a mosaic of species-rich habitats restored and connected across at least 30% of Britain's land and sea by 2030*". Rewilding Europe aims to rewild "*at least one million hectares of land/water, creating ten magnificent wildlife and wild areas of international quality*". Importantly, however, these initiatives lack detail in relation to suitable landscapes *where* these goals should or could be achieved i.e. there has not been a specific identification of *appropriate* locations upon which a supra-national strategy has been subsequently developed. And nor do they currently have a statutory basis. Nevertheless, much has been learned in the last decade, in terms of *how* to undertake rewilding, and indeed, many projects have been shown to result in substantial local biodiversity gains and improvements in ecosystem functioning (Svenning 2020).

Our results suggest, the rewilding approach in the UK remains primarily 'project' oriented i.e. focused on the site-based 'vision' of organisations involved in local rewilding initiatives. Since 2015, a number of rewilding networks have emerged in an attempt to coalesce local on-the-ground initiatives into something more regionally significant (e.g. see https://www.wildeast.co.uk/the-mission). These efforts have been supported by detailed guidance for organisations and individuals, in relation to the broad suite of legislative implications for rewilding at a site and regional level. *Rewilding Britain* (2023), suggested four core legislative themes where projects need particular support: (1) tax and subsidies, (2) access and liability, (3) land use and planning, and (4) wildlife reintroductions and licensing. These networks are also important in terms of communicating and sharing best practice,

Despite these considerable efforts to support and co-ordinate activities, there is currently no agreed *national* strategy for rewilding, and the huge growth in initiatives since 2010 (Figure 2), remains largely an *ad hoc* process i.e. without integration of wider taxonomic, cultural, and socio-economic issues. For example, our analyses of 66 rewilding sites, suggested the close geographical association of current activities with the national Protected Area Network (PAN) of statutory designated sites. But there is currently no national-level consideration or strategy, as to how the PAN could be enhanced through rewilding. It will be essential therefore, to dovetail future rewilding activities with statutory government initiatives such as the *Environmental Improvement Plan* (EIP, 2023), where designated sites play a major role in national landscape recovery goals. Our results also suggested a current focus on particular types of rewilding activities, e.g. the conversion of farmland, tree planting, and the

introduction of herbivores. And whilst these actions may potentially have localised net biodiversity gains, a more strategic approach would benefit a wider range of habitats and species, and is thus a missed opportunity. It may also result in the inefficient use of scarce resources, capacity and funding. We are therefore suggesting that there is an urgent need for the development of an evidence-led framework to support and guide rewilding at a UK level. A key element of this framework will be the production of a dynamic map that identifies areas where rewilding is likely to be:

(1) of greatest taxonomic and ecosystem benefit,

(2) socio-economically and agriculturally appropriate,

(3) relevant to the national protected area network (e.g. statutory designated sites such as SSSIs,

(4) resilient to future environmental change.

A wide range of sophisticated decision-support tools have been developed and evaluated that would allow the production of such a map (e.g. MARXAN, available at: https://marxansolutions.org/). These tools have played a key role in the rapidly growing field of Systematic Conservation Planning, SCP (Margules and Pressey 2000; Holness *et al*.2022), and will be of particularly high relevance and utility to future rewilding projects. This is because of the complexity that arises from the involvement of diverse, and often conflicting, stakeholder groups and local communities in areas being rewilded (Drouilly and O'Riain, 2021). For most current initiatives, identifying and mitigating *ecological* considerations and risks has been the principal focus for planning and implementation (Butler *et al.*, 2021). But this can lead to initiatives being undermined by social and economic considerations (e.g. stakeholder or local community opposition), rather than ecological issues (Coz and Young, 2020). Crucially, conservation decision tools (such as *MARXAN*), can integrate and account for social-ecological perspectives when identifying the spatial aspects of where rewilding would be appropriate and most desirable (Butler *et al*., 2019; Durant *et al.*, 2019). Spatial approaches using decision tools can also identify the range of different potential outcomes from the allocation of limited resources, as well as promote decision transparency and accountability (Butler *et al.*, 2021, Smith *et* al. 2022). Furthermore, SCP approaches can be dynamic i.e. respond to contextual changes over time (not produce mere snap shots of conditions), thus facilitating the exploration of a wide range of potential scenarios and desired outcomes. An SCP-derived map of rewilding potential would therefore be able to integrate national level taxonomic and ecosystem restoration goals, and consider these within the broader social, economic, policy, development, climate, and topographical characteristics of regions across the UK. Local Nature Recovery Strategies (LNRS) in the UK are mandated by the Environment Act (Environment Act, 2021). These initiatives have often resulted in free online mapping resources that cover broad thematic areas such as: ecosystem services, tree opportunities, nature recovery

networks, landscape connectivity, nature resilience, and protected area networks. The key problem is that these have been developed at a *county* level. And whilst land parcels that cross country boundaries are mapped considering the different methods used between mapping organisations, nature recovery plans in for example, the county of Kent, have no *strategic* connection to nature recovery in Gloucestershire, and may indeed be highly inefficient through the duplication of effort and unnecessary use of limited resources. Whilst local needs and contexts are central to the success of nature recovery, we argue that a national plan needs to be developed first, and then implemented at a county level, employing local needs and contexts. Similarly, there are now online tools available in relation to mapping resources for those involved in working on Nature-based Solutions (NBS) for biodiversity, climate, and people. But again, these are locally focused snapshots, and do not collectively allow the development of a national strategy based on the exploration of a range of desired outcomes and scenarios (Cohen-Shacham et al., 2019). In England, the new Environmental Land Management (ELM) scheme has been developed to support the rural economy, while achieving a range of environment and biodiversity goals and the UK government's commitment to achieve net zero carbon emissions by 2050 (DEFRA, 2021). The evidence-based mapping we are suggesting would include a range of tools for exploring focal areas in which ELMs would be most strategically relevant and needed.

We believe that a national scale evidence-led approach would therefore have ten major strategic and material benefits (core outcomes):

1. To remove the current '*ad hoc*' nature of the development of new projects, and allow wider conservation goals (UK level) to be addressed.
2. To ensure a greater range of rewilding projects that meet agreed methodological, ethical and social standards.
3. To provide the capability to link rewilding activities to measurable indicators of success in terms of biodiversity and the restoration of ecosystem functions.
4. To provide the rationale for new projects to focus on nationally important and high priority species, habitats, and ecosystems.
5. To provide clarity and transparency of aims for potential donors, funding bodies and planning authorities (improved compliance).
6. To promote coordination between rewilding activities and the range of other landscape-scale activities undertaken by conservation organisations, as well as future agri-environment payment schemes.
7. To allow the development of consistent metrics of success (e.g. goal attainment and biodiversity net gain).

8. To provide a means to ensure that rewilding activities are compatible with, and support the aims of the current suite of designated areas (e.g. SSSIs) and protected area networks.
9. To support the development of UK landscapes in line with the Lawton report (Lawton, 2010): bigger, better, joined-up.
10. To ensure future rewilding activities are located in areas whose characteristics and features suggest resilience to future climate change.

The adoption of a more evidence-led approach to rewilding (through the development of a decision tool and a national rewilding map), would need to be built on a foundation of further research and consultation within and between a range of sectors. We are recommending four key actions that urgently need to be undertaken:

1. The development of a *Roadmap* for producing and implementing a national rewilding decision tool and map. This would outline the key process elements and identify the requisite stakeholder and community groups (Kostoff and Schaller, 2001; Gindy *et al*. 2006).
2. The development of a *Theory of Change* (Mayne 2015) i.e. the identification of areas of required social, economic, land management, and legislative change, associated with the implementation of the new evidence-led approach.
3. The production of *Best Practice* guidance for rewilding initiatives, including agreed national standards (Dudley 2008).
4. The development of *Indicators of Change* (Branquinho 2019) to allow biodiversity gains from rewilding to be assessed at both site and national levels.

CONCLUSION

Rewilding has become a well-established approach to maintaining and enhancing biodiversity, whilst reducing costly management actions across a broad range of sites (Driver 2022; Thierry and Rogers 2020). In this paper, we have identified the benefits of a nationally focussed and evidence-led approach i.e. one that is spatially explicit (encompasses landscape scale characteristics), related to national species and habitat priorities, accounts for future landscape changes, and is sensitive to local socio-economic and agricultural contexts. This approach will need to be implemented quickly, if rewilding is to be used for addressing the national biodiversity crisis within a relevant timescale. Importantly, both the data and the analytical frameworks and tools already exist to allow the required analyses to take place (Margules and Pressey 2000; Holness *et al*.2022). But beyond the production of the proposed national map of 'appropriate' sites for rewilding, the long-term success of rewilding will require a transformative change within the conservation sector. Conservation organisations, research institutions, and responsible statutory agencies will need to 'mainstream' rewilding, and support it

with appropriate policy and funding instruments (Davila, 2021; Meyers *et al.*, 2020). Only when a suitable 'enabling' environment is in place, will rewilding reach its full potential and go beyond the current *ad hoc* collection of individual project sites (Corlett, 2016; Cisneros-Montemayor *et al.*, 2021).

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