

## Rewilding and Other Modes of Ecological Restoration, as Viewed From the Perspective of a Hardy Orchid

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Many countries, including the UK, have recently experienced an upsurge of interest in various aspects of ecological restoration. This enthusiasm is epitomised by Target 2 of the Global Biodiversity Framework, which commits to ensuring that 30% of degraded habitats will be under effective restoration by 2030. This is no mean task – for example, the excellent recent report by State of Nature (Burns *et al.* 2023) notes that only 25% of the UK’s peatlands and a startlingly low 7% of woodlands are formally categorised as being in “good condition.” If our more modest community of orchid enthusiasts is also to address this challenge, we need to begin by identifying realistic goals, and deciding what kind and scale of projects are needed to achieve them. In particular, we should determine exactly which roles hardy orchids are best qualified to play in restoration, and distinguish them from roles that orchids are, by their very nature, obliged to leave to other, better suited groups of plants.

### What is restoration ecology?

Ecological restoration is an umbrella term that covers a multitude of sins. It is defined by Wikipedia as “the practice of renewing and restoring degraded, damaged, or destroyed ecosystems and habitats in the environment by active human interruption and action”. For the Society for Ecological Restoration it is “an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability”, ecosystems being “dynamic communities of plants, animals, and microorganisms interacting with their physical environment as a functional unit.”

Missing from these definitions, but nonetheless implicit in most texts addressing restoration, is the idea that the aspects of degradation, damage and/or destruction in question are the result of mankind’s activities, rather than being a purely natural phenomenon (this is actually a deceptively challenging distinction, as we will see). Also missing from these definitions, but this time deliberately, is a sense of scale – both the scale of the damage already done (summarised in Fig. 1) and the scale of the area of landscape that has been affected are relevant. The concept of ecological restoration can seemingly encompass anything from massive landscape-scale interventions through to introducing a square metre of wildflowers into a previously pristine garden. The conceptual breadth of restoration ecology, encompassing a myriad of activities, means that it is important that categories of activity within the discipline should be defined more precisely. Also, we should consider the parallel distinction between conservation and gardening; in practice, this is another continuum – one that depends on relative degrees of naturalness (Bateman 2010).

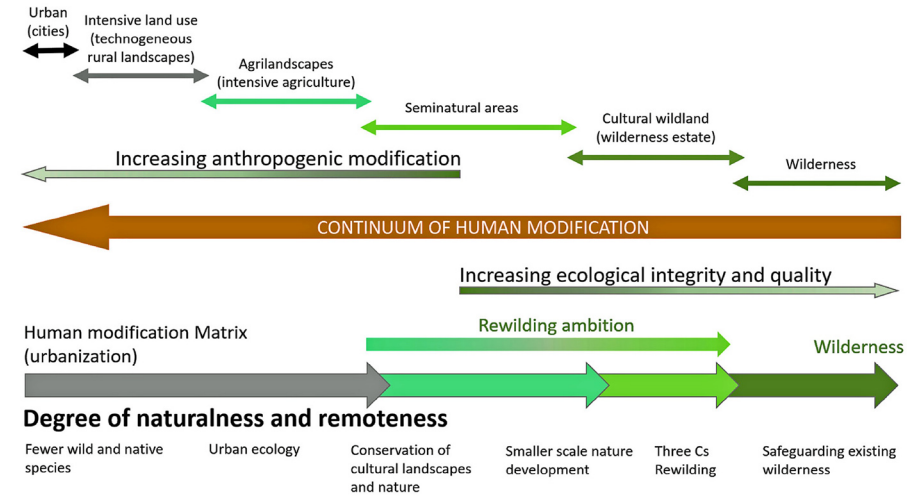


Fig. 1: Diagram summarising what was termed “the wilderness continuum” by Carver *et al.* (2021; their Fig. 2). As human-induced modification of the landscape intensifies (above the red arrow, toward the left), the task of reversing the degradation becomes more complex and intimidating (below the red arrow, toward the right).

### What is rewilding?

Unfortunately, some commentators (including the Royal Horticultural Society, and many media outlets) have chosen to lazily synonymise ‘ecological restoration’ with ‘rewilding’, perhaps because rewilding is a more appealingly dynamic and dramatic term. In fact, no less than 33 global experts recently collaborated to develop an agreed definition of rewilding, and to establish a set of ten principles to underpin the concept. According to them, “rewilding is the process of rebuilding, following major human disturbance, a natural ecosystem by restoring natural processes and the complete or near-complete food web at all trophic levels as a self-sustaining and resilient ecosystem with biota that would have been present had the disturbance not occurred ... The ultimate goal of rewilding is the restoration of functioning native ecosystems containing the full range of species at all trophic levels while reducing human control and pressures. Rewilded ecosystems should – where possible – be self-sustaining, ... requiring no or minimal management” (Carver *et al.* 2021: 1888). The organisation Rewilding Britain seemingly agree with these underlying concepts, defining rewilding as “the large-scale restoration of ecosystems to the point where nature is allowed to take care of itself”, and noting that “rewilding seeks to reinstate natural processes and, where appropriate, missing species – allowing them to shape the landscape and the habitats within.”

Thus, rewilding is by definition big-picture restoration; many of the projects currently labelled as rewilding do not currently qualify. Fortunately, the “ten principles of rewilding” remain relevant across the broader range of activities collectively categorised as landscape restoration. Genuine rewilding requires serious consideration of landscape-scale issues such as facilitating migration by deliberately interconnecting ‘core’ islands of biodiversity (e.g. large nature reserves or national parks), a goal to be achieved using linear ‘corridors’ where possible and otherwise employing more isolated ‘stepping stones’ (familiar, if smaller-scale, examples of such linkages in an arable landscape would be linear hedgerows and isolated copses, respectively). Emphasis is inevitably placed on species that are unusually frequent and/or unusually influential in the ecology of that landscape. For animals, herds of herbivores and keystone predators would qualify, whereas for plants, dominant tree or grass species would likely gain top billing. When contemplating the reintroduction of species, animals inevitably claim the limelight (e.g. Tree & Burrell 2023). Despite the recency of their reintroduction, beavers are already spreading rapidly across the British landscape, while bison have now been awarded their own corner of Kent as an experimental playground. Sea eagles once again patrol our skies and reindeer once again graze the Cairngorms, where the right to roam may soon controversially be extended to the lynx.

But where are their botanical equivalents? The truth is that most plant (and animal) species genuinely native to the British Isles migrated here within the last 11,700 years of fully post-glacial climate – and our flora remains so impoverished that thus far there have been relatively few opportunities for subsequent extirpations. Most of the losses that have occurred are likely to have been herbaceous species, including glacial relicts, that were uncommon even before mankind began to impact substantially on the original natural ecosystems. Thus, although there have undoubtedly been shifts in ecological dominance – for example, the retreat of the Scots Pine to a handful of surviving Caledonian refugia – there have been few well-documented extirpations thus far during the historical period. The one officially recognised loss of a native orchid – Summer Ladies-tresses, eliminated from the New Forest by 1953 – is generally attributed not to indirect human effects on the relevant habitat but instead to the direct impact of the vast numbers of plants murdered to enhance innumerable herbaria. Rather than emphasising reintroductions, British and Irish conservationists remain focused on trying to prevent further losses among our ca 1390 unequivocally native plant species. Nonetheless, plant species restoration projects are probably best epitomised by orchids, most notably several decades of (rather accident-prone) attempts to bulk up the representation in northern England of the formerly far more widespread Lady’s-slipper Orchid.

#### **Minimalistic role of terrestrial orchids in macro-ecology**

The first three principles of rewilding focus on “trophic interactions” (crudely, who

eats who), “landscape-scale [spatial] connectivity” and “recovery of ecological processes.” But orchids constitute only a tiny proportion of the biomass in any habitat in which they occur, reliably failing the criterion for ecological dominance. The one arguable exception where orchids constitute a significant percentage of the ground flora – the presence of Birds-nest Orchid and some Helleborines in densely shading woodlands – simply reflects the absence of most other flowering plants, which lack the orchid’s ability to use mycorrhizal networks to plumb into surrounding trees as a convenient source of nutrients. Across all habitats, orchids are too uncommon to aid long-distance connectivity among non-orchid species, and have no involvement in ecological processes that are likely to dictate the overall nature of the local vegetation.

Perhaps we could rescue the ecological importance of orchids by considering their “trophic interactions”? After all, orchids have long been justly famous for the “various contrivances” that they employ to successfully exploit animals as pollinators. But in the majority of cases the orchid is parasitizing the pollinating insects, who often receive no reward. And even in the case of orchids that do provide a welcome nectar reward, there will usually be present other non-orchid species that provide an alternative source of nectar equally appealing to the orchid’s pollinators. Nor am I aware of any orchid having been shown to be essential to the continued presence of particular species of mycorrhizal fungus. Thus, I doubt that any ecosystem will ever collapse through loss of its orchid species; in no way can they be considered as ecologically crucial ‘keystone’ species. Rather, from a macro-ecological perspective, orchids are trivial components of any particular temperate ecosystem – the ornaments atop the icing of the ecological cake. Consequently, they are therefore likely to be, at best, only accidental beneficiaries of any scheme that fits the correct definition of rewilding.

#### **Roles in restoration ecology more suited to terrestrial orchids**

Happily, certain other of the ‘ten principles of rewilding’ appear more relevant to the orchid family. We are told that “rewilding is informed by science” and is “dependent on monitoring and feedback” (Carver *et al.* 2021). Both of these principles depend upon having ready access to in-depth knowledge of the relevant organisms – not only pre-existing knowledge but also ongoing field monitoring and focused research designed to add to that knowledge base. Here we have found one area where our orchids are likely to feel superior to most other plant families with which they co-exist. From Darwin onwards, orchids have proven their lasting appeal as rewarding study organisms. We have learned much about what differentiates orchids from other groups of plants, and about how they develop, grow and reproduce. More broadly, we have gained greater knowledge of how orchids interact with pollinators and, more recently, with mycorrhizal fungi – their place within terrestrial ecosystems is consequently unusually well-understood.

Perhaps the best way to view the contribution of orchids to landscape restoration – and indeed also to landscape conservation – is to treat them as ideal indicators of whether attempts to restore or preserve landscapes are meeting with success. When a plant community begins to fail, orchid species are typically among the ‘loss leaders’ (Fig. 2). Better still, we understand our native orchids sufficiently well to at least indulge in informed speculation regarding why they might be failing in any particular instance. Conversely, the arrival of orchids into a locality through natural means could be seen as welcome evidence that the habitat is becoming more amenable.

Indeed, it might be predicted from first principles that the tiny ‘dust-seeds’ of orchids, well-adapted for transport in high-level air currents, would be among the first (re)colonisers of an improved habitat. Rather than gradually migrate along wildlife corridors, orchid species can in theory travel saltatorially, skipping over – rather than passing through – unappealing areas of the landscape in order to reach the relative safety of further ‘stepping stone’ habitats (the most obvious ‘unappealing area’ that, given post-glacial sea levels, severely limits plant migration to Britain is the English Channel). For example, during its current rapid northward migration, the Bee Orchid appears to have jumped over the Southern Uplands of Scotland in its urgent desire to reach the balmy lowland climates of the Scottish Midland Valley. However, other kinds of evidence suggest that long-distance jumps are in practice rare. Most orchid seeds that germinate successfully do so no more than two metres from their source plant, presumably benefitting from immediate infection by their ‘mother’s’ mycorrhizal network (Jacquemyn *et al.* 2012). And my (as yet unpublished) body of bespoke genetic data, gathered explicitly to address the speed of postglacial migration across Europe, suggests that the average species of orchid marched northwards at about the same (stately) rate as the average species of oak.

It is less clear whether the initial success of some deliberate (re)introductions of orchids into a landscape means that the attempt will prove successful in the longer term. Wholesale removal of topsoil, followed by equally wholesale destruction of the existing vegetation through repeated treatments with herbicide, can demonstrably pave the way for creating an impressively orchid-rich meadow (Trudgill 2023). However, in most cases, those artificial ecosystems will still require regular maintenance by humans if they are to persist beyond the short term, limiting their wildness. It is arguable whether such strongly interventionist projects legitimately qualify as landscape restoration – landscape replacement seems a more apt description.

Using orchids as indicators of the health of their host ecosystem is made easier by their innate charisma; they appeal equally to field botanists and gardeners, and so have been the ‘poster organisms’ for innumerable conservation initiatives. The very existence of the Hardy Orchid Society is a testament to that lasting appeal; we provide an increasingly valuable route into the “local engagement and support” that

is promoted as another of the ten requirements for effective rewilding. Who better to monitor native orchids as ecological indicators than an expanding body of naturalists who have determinedly made themselves competent to identify, record and monitor orchid occurrences?

#### **An unstated dilemma: do any ecosystems actually remain natural?**

But in my opinion there is now a mammoth in the room – a dilemma that is rarely if ever explicitly stated. I would argue that much of what I have written thus far is currently being challenged, at a fundamental level, by galloping climate change (e.g. Bateman 2022). It is already clear that the present year (2023) will yield the highest global mean annual temperature (MAT) since the Ipswichian/Eemian – the last major inter-glacial period, ca 125,000 years ago, when hippos and rhinos occupied Trafalgar Square! Few observers doubt that the widely predicted increase of 2°C in global MAT, likely to be reached well before 2050, will have a profound effect on global landscapes. Planned responses to anthropogenic climate change are generally labelled as either mitigation – attempts to reduce the rate of climate change – or adaptation – attempts to accommodate the effects of climate change. The principles of rewilding state that rewilding initiatives “should anticipate the effects of climate change”, suggesting a focus on adaptation more than mitigation. However, arguments are also often made that ecosystem restoration can also play its part in mitigation; for example, by locking up additional organic carbon. But when viewed more broadly, it seems to me that anthropogenic climate change presents us with a particularly stark ‘Catch 22’ situation. Rewilding seeks to compensate for damage to the environment caused by human activity (Fig. 1), but the current phase of climate change has itself been caused by a vast panoply of human activities. Given that anthropogenic climate change is increasingly profound and undeniably global in its effects, does any ecosystem on Earth remain truly natural? Hasn’t the world already been altered irrevocably by human activity?

Humans residing in Europe 10,000 years ago, caught in the act of transitioning from Palaeolithic pack-hunters to Mesolithic hunter-gatherers, witnessed first-hand the catastrophic degradation of familiar ecosystems due to climate change. Like us, they surely would have wished to reverse the then rapid decline of previously dominant tundra vegetation that featured ground-hugging arctic-alpine plants such as Dwarf Willow and Mountain Avens. How else could they have sought to maintain the vast tracts of grazing lands needed to continue providing them with their familiar and seemingly essential range of mammoth-derived products?! Irrespective of how much of today’s technology were to be placed at the disposal of Mesolithic humans, any attempt to preserve the tundra would of course have still been doomed to failure, given the profound nature of the rapid climatic shift they had just endured. Indeed, the increase of ca 7°C in MAT documented in Greenland ice-cores during a period of just ca 50 years is four times the industrially-driven rise in MAT presently anticipated by 2050. Unable to mitigate these changes, given that they reflected natural causes



way beyond their control, Mesolithic humans had no choice but to adapt instead to a profoundly altered environment through radical modification of their entire approach to life. I suspect that they viewed as poor compensation the consequent natural arrival of hardy orchid species into a formerly inhospitable but now rapidly warming Britain.

In contrast, we modern humans have at our disposal a brief opportunity to partially mitigate, rather than merely adapt to, the impending climate crisis. The tenth (and final) principle of rewilding is that to be successful it “requires a paradigm shift in the co-existence of humans and nature, ... such that society no longer accepts degraded ecosystems and over-exploitation of nature as the baseline for each successive future generation” (Carver *et al.* 2021: 1890). Unfortunately, it seems to me that – for all the lip-service now paid to the task – the responses to anthropogenic climate change worldwide have been too shallow and too slow, and will remain so – at least, until various climate-related crises coalesce into an irreversible ‘perfect storm’. Recent history has demonstrated conclusively that even the slightest economic setback immediately induces collectively selfish behaviour within the human population. I regret that I cannot under any circumstances envisage the concessions being made that I believe are necessary for an effective response: acceptance of economic stasis, concomitant reallocation of existing resources, and serious consideration of the even more politically toxic subject of population control.

Relevant here is the banner headline that emerged from analysis of the massive volume of distribution data in the latest plant atlas of Britain and Ireland – that, for the first time in history, non-native species outnumber native species in our supposedly ‘wild’ flora (Walker *et al.* 2023). Orchids are at present under-represented in the expanding roster of non-native species, most of the few ambiguous cases of possible unnatural arrival being confined to the genera *Ophrys* and *Serapias* (Fig. 2). For now, I will stand by the arguably puritanical views that I first expressed in the pages of *JHOS* 14 years ago (Bateman 2010), primarily reflecting my desire to be able to continue monitoring ‘natural’ changes in our orchid populations without suffering the complicating factor of innumerable poorly coordinated human interventions. I still believe that deliberate local introductions made beyond the boundaries of formal gardens should be carefully considered, be properly documented, and should not extend the natural distributional margin of the species in question. But when I consider the likely longer-term future of what remains of our countryside, I begin to wonder whether the distinctions between rewilding, smaller-scale forms of ecosystem restoration, and strictly defined gardening will soon become so blurred by increasingly desperate responses to the effects of climate change that they will no longer be meaningful. Much to my regret, the survival of species and ecosystems may in time become judged more important than maintaining the pretence that anything that remains is truly natural.



Fig. 2: Possible winners and losers in the face of the rapidly approaching 2°C rise in mean annual temperature. Cold temperate/high altitude specialists such as Creeping Lady's-tresses (*Goodyera repens*, top left) and Small-white Orchid (*Pseudorchis albida*, top right) are already showing signs of retreat within the British Isles. In contrast, more southerly species native to mainland Europe, such as Giant Orchid (*Himantoglossum robertianum*, bottom left) and Small-flowered Tongue-orchid (*Serapias parviflora*, bottom right), are actively migrating northwards.

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**Orchid Meadows and Rewilding.****Bill Temple****Orchid Meadows**

A landowner can plant anything on their land unless it is a banned plant (such as Japanese Knotweed). Creating an orchid meadow on your own land is basically gardening. It is best if you can use legal seed collected from local plants as it is then likely to be appreciated locally and not controversial. Local landowners with orchids will often give permission for small amounts of seed to be collected and Wildlife Trusts will often give permission for small amounts of common orchid seed to be collected although they may ask for a donation. Alternatively they may collect the seed themselves and sell it to you; there is no harm in asking.

It is controversial to obtain seed of species that are not found locally from elsewhere in the UK and you should inform BSBI if the seeds grow. Pollinating insects carry pollen for anything up to five miles so pollen from non-local orchids would not be confined to your land and could affect the genetic variability of our native species elsewhere. It would not be wise to do this if there is an SSSI or nature reserve within

ten miles (i.e. within bee range). However, orchid seed spread is not range restricted, although most falls within a metre or two: Lizard Orchids popping up in Oxfordshire are probably descended from plants near Bristol. *Spiranthes romanoffiana* has recently appeared in several new countries, probably either due to seed arriving from Ireland or the USA.

Foreign seed (although at present it has become difficult and expensive to obtain due to new regulations imposed as a result of Brexit) should not be used for the reasons in the paragraph above. Our native orchids tend to grow in either impoverished land, oxygenated wet areas or in woodlands. Few of our native orchid species can cope with an untended, overgrown lawn. I know of one case where a lawn containing 300 flowering Bee Orchids was not mown for a year and the following summer 30 flowered. The grass was then cut and left lying, after which in the next year I found only four. Regular mowing of lawns with a period of non mowing can result in lawns with a number of our native orchids and wild flowers growing happily. I can provide information about mowing regimes for common species on request.

What most people regard as wildflower meadows are impoverished chalk grasslands that support orchids such as Bee Orchid, Pyramidal Orchid, Common Spotted-orchid, Frog Orchid, Lady's Tresses, Burnt Orchid and Musk Orchid growing among our downland flower species. Former agricultural land and domestic lawns rarely fit the description of impoverished land. In the past it was thought that the fertility of land could be reduced by simply cutting it regularly and removing the cuttings. The current view seems to be that at best this merely retains the current fertility.

To create a wild flower meadow with chalk downland flowers and orchids it is often necessary to remove the top layer of soil. This is an extremely expensive process due to the disposal and transport costs. Some members of the society have experience of doing this in small areas and have written about their methods and results in *JHOS*. The wildlife area behind my house which was formerly agricultural land was sown with a wildflower mixture when the solar farm was constructed and has not been cut since. Although it contains a tiny number of orchids in less fertile areas, they are struggling to compete with the other, mainly rank, vegetation. It does not contain any sources of nectar in winter, but has seed heads for the finches. Figures 1 & 2 show a section in summer and winter.

What happens when former agricultural land is allowed to go wild varies with its former use. In my area, former wheat fields tend to contain agricultural weeds at first such as Poppy and Field Pansy then invasive species such as Oxeye Daisy, Ragwort, Willowherb, Teasel, Prickly Oxtongue, Sowthistles, Creeping Thistle, Stinging Nettle and Dock. Eventually hedgerow plants such as Bramble, Blackthorn, Dog Rose, Hawthorn, Willow and Dogwood start to appear.





### **Reintroductions**

HOS has experience of trying to reintroduce species of orchids into former sites where they became extinct. The usual problem with this is that we do not know why they became extinct or where in the site they were. It is preferable to use symbiotically raised flowering sized plants when doing this as we do not know if the sites still contain the original symbiotic fungi. The alternative is to scatter seed. It is not usually controversial if legal seed from the nearest existing colony is used and it can also be locally popular. Both these methods are a hit or miss process although scattering seed can cover a much larger area. You can learn how to raise our common orchids artificially from seed at our annual seed sowing workshop.

### **Garden Wildlife Areas**

This is basically not cultivating an area of land and allowing nature to take its course, possibly after adding some flowers to assist pollinators. Ideally there should be nectar rich flowers available all year. This is encouraged by the wildlife organisations as it improves biodiversity. Including a pond can add biodiversity quickly (if it does not include fish) and it is also encouraged for that reason. Information on doing this is widely available from Wildlife Trusts. RHS biodiversity trials suggest that nectar rich flowers are very popular with pollinators, whether they are native or not. Biodiversity may however be better if native flowers are used as much as possible. Some people consider this to be rewilding and this term is used in its call to rewild in the February 2023 issue of *The Garden*, which is the magazine of the RHS. However, in the November 2023 issue of *The Garden*, the Director General of the RHS (Clare Matterson) later made it clear that she regards this as ‘wildlife friendly gardening’ or ‘planet friendly gardening’ rather than rewilding

### **Rewilding Projects**

These involve trying to create large, ecologically balanced, self regulating areas that require minimal routine intervention. Obtaining an ecological balance is far from simple however as it means a balance of hunters and hunted throughout the whole food chain so missing species may need to be re-introduced. It often requires major landscaping or drainage work and it can sometimes face local opposition and be controversial. It can also take years to get plans agreed by the various statutory bodies and years to stabilise. However, it can be spectacularly successful as for example in the Knepp Estate. More information can be found at <https://www.rewildingbritain.org.uk/why-rewild/what-is-rewilding>.

Fig. 1: Wildlife area in summer.

Fig. 2: Wildlife area in winter.

Photos by Bill Temple