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Rebuilding nature
Good practice guidance for ecological restoration

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Ten good practice principles are set out for ecological restoration projects in the terrestrial, freshwater and marine environments of the UK and Ireland. This guidance was prepared by the CIEEM working group on good practice guidance for ecological restoration that was established by the CIEEM Habitat Creation and Ecological Restoration Special Interest Group. The guidance is intended for restoration practitioners working in land and water management or on development projects.

The guidance provides an introduction to ecological restoration, the importance of a robust and consistent approach to ecological restoration, links to more detailed information, a glossary of key terms and the 10 good practice principles. The guidance focuses on habitat and ecosystem scales of restoration, rather than the restoration of individual species, although it is recognised that the restoration of some species can have ecosystem level impacts.

This guidance is being published in advance of the detailed habitat material to stimulate discussion and comments. Please contact erhc@cieem.net to provide comments and feedback.

Introduction

Importance of ecological restoration

Biodiversity loss, habitat fragmentation and climate change present unprecedented challenges and the actions we take now will fundamentally affect our lives and the lives of future generations. To combat these pressing issues and make space for nature we need more, bigger, better and joined up sites to create sustainable, resilient and more effective ecological networks[1]. Effective and large-scale ecological restoration, underpinned by the re-establishment of ecological processes and ecosystem services, is needed for the benefit of both people and wildlife.

Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed[2]. This captures enhancement measures for habitats (creation, restoration and translocation) and species (e.g. through conservation translocations). Ecological restoration also encompasses 'rewilding'. More information on rewilding can be found in CIEEM's Rewilding: Position Statement[3] and through the definition and guiding principles published by the IUCN in 2021[4].

High quality and effective ecological restoration aims to make important contributions to local, regional and national priorities for nature conservation and deliver wider ecosystem services. Ecological restoration is also fundamental to the successful delivery of Biodiversity Net Gain, which is the approach to development, land and marine management that leaves biodiversity in a measurably better state than before and is a planning requirement in England[5]. Biodiversity Net Gain aims to create new habitats as well as enhance existing habitats, ensuring ecological connectivity provided for wildlife is retained and improved. It is vital that the good practice principles for ecological restoration in this guidance are followed to ensure Biodiversity Net Gain is achieved.

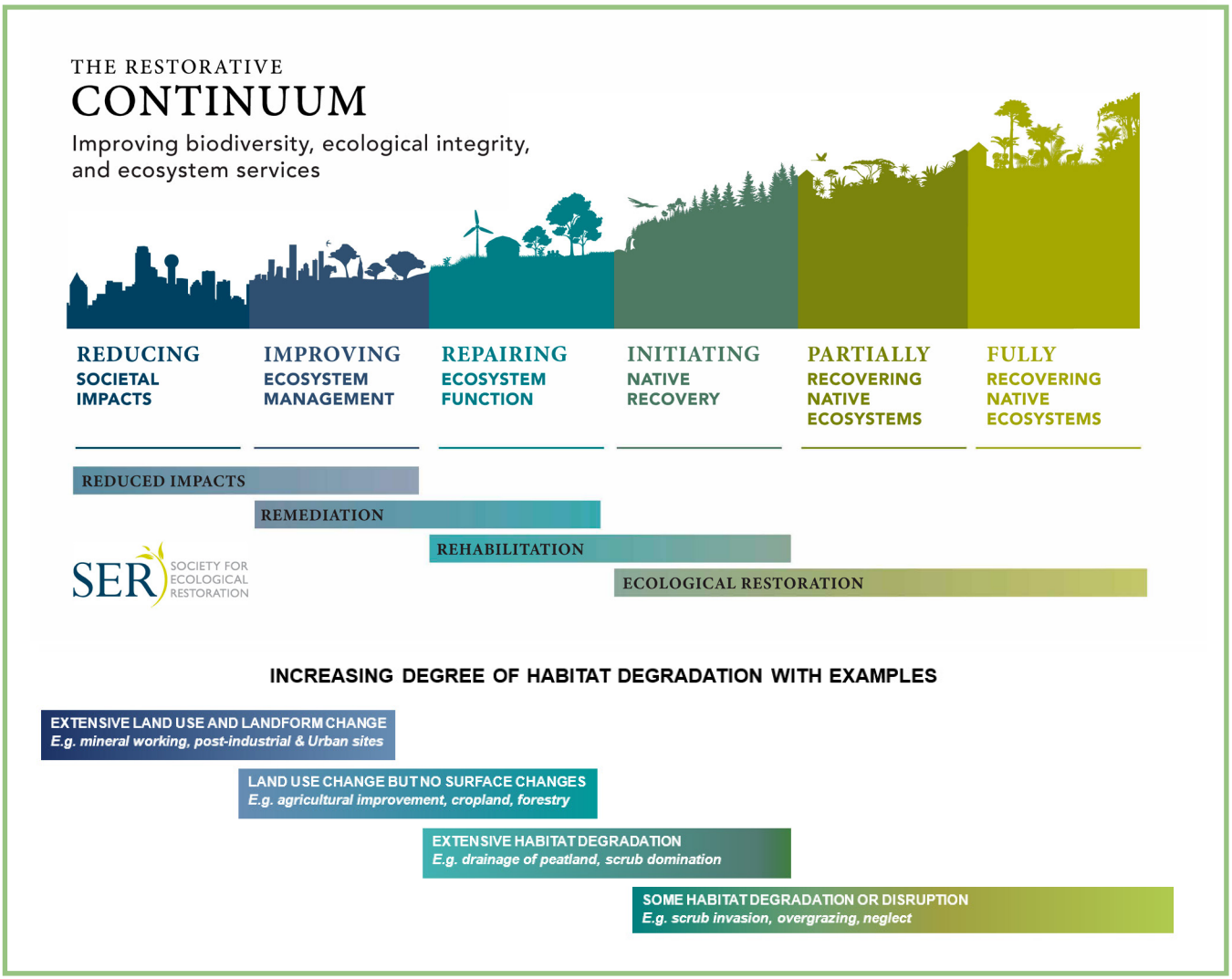
Ecological restoration measures are part of a continuum of restorative activities, depending on the degree of degradation and departure from a functioning ecosystem. Any restorative action must consider the habitat and connectivity to it, not just the site. The Restorative Continuum, from the Society For Ecological Restoration International Principles and Standards for the Practice of Ecological Restoration[2] showcases the different levels of restoration **(Figure 1).** It visualises a holistic approach to repairing ecosystems while enabling restoration practitioners to apply the most appropriate and effective restoration treatment for their specific ecological, social, and financial context.

The CIEEM working group has produced a set of **key references** to help ecologists and environmental managers design and manage effective restoration projects. This reference list is not intended to be exhaustive and it will be updated as each section of the guidance is written.

1. Lawton, J. et al. (2010). *Making Space for Nature: a review of England's wildlife sites and ecological network.* A report to Defra. Available: https://www.gov.uk/government/news/making-space-for-nature-a-review-of-englands-wildlife-sites-published-today
2. Gann, G.D. et al. (2019). International principles and standards for the practice of ecological restoration. Second edition. *Restoration Ecology,* S1-S46. Available at: https://onlinelibrary.wiley.com/doi/10.1111/re.13035
3. CIEEM (2020) Rewilding: *Position Statement.* Available at: https://cieem.net/wp-content/uploads/2020/06/CIEEM-Rewilding-PS-2020.pdf
4. IUCN (2022) *Rewilding Principles.* Available at: https://www.iucn.org/sites/default/files/2022-10/principles_of_rewilding_cem_rtg.pdf
5. Natural England (2022). Biodiversity Net Gain. *An introduction to the benefits.* Available at: https://naturalengland.blog.gov.uk/wp-content/uploads/sites/183/2022/04/BNG-Brochure_Final_Compressed-002.pdf

Figure 1.

The SER Restorative Continuum[2] modified to include examples of increasing degree of habitat degradation.



Glossary

A glossary of key terms involved in ecological restoration is provided below.

Term	Definition
Conservation translocations	The deliberate movement of organisms from one site for release in another. It must be intended to yield a measurable conservation benefit at the levels of a population, species or ecosystem, and not only provide benefit to translocated individuals[6].
Ecological restoration	The process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed[2]. This captures restorative measures for habitats (creation, enhancement and translocation) and species (e.g. through conservation translocations). Other terms with intermediate and overlapping meanings are reclamation, rehabilitation, remediation.
Ecosystem	Dynamic complexes of communities of living organisms and their non-living environment, which interact to form functional units. A habitat or a group of related habitats can be considered an ecosystem. The emphasis is mainly on the interrelationships between and within the biotic and abiotic components[7].
Indigenous range	The indigenous range of a species is the known or inferred distribution generated from historical (written or verbal) records, or physical evidence of the species' occurrence[5]. In the UK the term 'natural range' is used in legal contexts.
Habitat	A place where plants or animals normally live, characterised primarily by its physical features (topography, plant or animal physiognomy, soil characteristics, climate, water quality etc.) and secondarily by the species of plants and animals that live there[7].
Habitat creation	The creation of habitats on sites that are either bare or have a very low wildlife value[8].
Habitat enhancement or restoration	Restoring ecosystems for the specific purpose of providing habitat either for the individual species or for the entire suite of species likely to be found in an area[9].
Habitat translocation	The process of moving soils or substrates with their vegetation and any animals that remain associated with them in order to rescue or salvage habitats that would otherwise be lost due to changes in land use, or to restore biodiversity to sites that have been damaged or degraded, or to newly created sites[10].
Rewilding	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[4]. Rewilding must reflect society and heritage to achieve more resilient and autonomous ecosystems. This requires engaging and ideally benefiting local communities. It differs from other approaches in seeking to enable natural processes which eventually require relatively little management by humans[11].

6. IUCN/SSC (2013). *Guidelines for Reintroductions and Other Conservation Translocations.* Version 1.0. Gland, Switzerland: IUCN Species Survival Commission, viiii + 57 pp. Available at: https://portals.iucn.org/library/efiles/documents/2013-009.pdf
7. European Environment Agency (2023). *An Introduction to Habitats.* Available at: https://www.eea.europa.eu/en/topics/in-depth/biodiversity/an-introduction-to-habitats
8. Gilbert, O.L. & Anderson, A. (1998). *Habitat creation and repair.* OUP.
9. Miller, J.R. & Hobbs, R.J., (2007). *Habitat restoration—Do we know what we're doing?* Restoration Ecology, 15(3), 382-390. Available at: https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1526-100X.2007.00234.x
10. Anderson, A. & Groutage, P. (2003). *Habitat translocation - a best practice guide.* C600, CIRIA, London. Revised by Box, J. (2003). Critical factors and evaluation criteria for habitat translocation. Journal of Environmental Planning and Management 46: 839-856. Available at: https://www.researchgate.net/publication/227619604_Critical_Factors_and_Evaluation_Criteria_for_Habitat_Translocation
11. Waylen, K.A. & Marshall, A. (2023). *Defining Rewilding for Scotland's Public Sector.* Scottish Government, Edinburgh. Available at: https://www.gov.scot/publications/defining-rewilding-scotlands-public-sector/pages/7/#:~:text=%22Rewilding%20means%20enabling%20nature's%20recovery,more%20resilient%20and%20autonomous%20ecosystems

Establishing good practice principles

Adherence to good practice principles will ensure ecological restoration projects are delivered in the right place at the right time and will bring about long-lasting and meaningful benefits to biodiversity at local, regional and national scales.

These principles are relevant to developers, designers, practitioners and other stakeholders (including local communities) wishing to promote, facilitate and deliver effective ecological restoration projects. They also provide a framework for industry and other stakeholders to demonstrate that projects have followed good practice. Over time, we will produce detailed guidance, based on the available evidence and professional expertise, and illustrated by case studies.

The restoration of individual species are included where they form a habitat and/or contribute significantly to ecosystem functions and processes, such as seagrasses or native oyster. Otherwise guidance on translocating or managing individual species can be found elsewhere.

It is important that these good practice principles listed below are tested, refined and improved through feedback and review. The CIEEM Habitat Creation and Ecological Restoration Special Interest Group's working group on good practice guidance for ecological restoration will undertake a first review within 12 months of publication.

Supporting guidance

These principles are broad by necessity so they can apply to a wide range of habitats, scenarios and stakeholders. This means that their proper interpretation is critical. Follow the links for more detailed information and evidence.

Good practice principles for ecological restoration

These principles set out good practice for designing and implementing effective ecological restoration projects and should be applied all together as one approach. There may be exceptional circumstances where one or more of these principles may not be relevant and these should be justified where omitted.

Principle 1. Set clear, measurable goals

Identify the desired nature conservation outcome(s), evaluate the different mechanisms to achieve the desired outcome, select the best mechanism and then set clear, measurable goals to demonstrate whether the outcome(s) has been achieved. The desired outcome may be targeting a specific habitat type and condition, population size, species composition (including the presence of positive and negative indicators) or an establishment timescale informed by native reference ecosystems whilst considering environmental change.

Principle 2. Apply 'Bigger, better, more and joined-up' approach

Apply the Lawton principles of 'bigger, better, more and joined-up' when designing and implementing ecological restoration projects. Integrate designs into the wider landscape and contribute towards local, regional and national nature conservation strategies.

Principle 3. Avoid adverse impacts

Effective ecological restoration projects must avoid adverse effects to habitats and species populations of high conservation value. Assess the potential risks and benefits of the ecological restoration project, with associated measures of likelihood or risk and potential risk mitigation.

Principle 4. Apply 'right place, right time' approach

Establish a robust baseline to ensure ecological restoration projects are delivered targeting the right habitats and species in the right place at the right time. This includes consideration of:

- Physical environment context (including factors such as landscape setting, aspect, topography, soils and hydrology)
- Current and past land-use
- Cultural history and archaeology
- Species presence (past and present)

Principle 5. Follow the mitigation hierarchy

Restoration practitioners must ensure that projects follow the mitigation hierarchy: avoid, mitigate, restore/enhance, compensate. This means doing everything possible to avoid losing biodiversity in the first place before deciding to deliver ecological restoration projects to compensate for losses.

Principle 6. Plan for the future

Ensure successful ecological restoration in the long-term by:

- Creating and implementing clear management and monitoring plans to measure and report on successes and failures
- Using the right equipment and machinery (where applicable) to deliver the works
- Securing dedicated funding for long-term management, maintenance and monitoring
- Ensuring land is protected by a conservation covenant or similar legal framework
- Mitigating risks from other land uses, climate change and other future pressures
- Measuring the success of the restoration activities through quantitative analysis, against the original project aims and objectives.

Principle 7. Engage with stakeholders and local communities

Engage stakeholders and local communities early, and involve them in designing, implementing, monitoring and evaluating the approach to habitat creation and ecological restoration. Deliver projects in partnership with stakeholders and local communities, drawing on local and traditional ecological knowledge and sharing the benefits fairly amongst all involved to promote environmental justice.

Principle 8. Engage with other disciplines

Draw on knowledge from other disciplines when designing and implementing ecological restoration projects. Collaboration with other professionals including landscape architects, soil scientists, geologists, hydrologists, civil engineers and archaeologists is essential to avoid conflicting interests and the viability of designs (e.g. that soil resources are matched to habitat requirements). For species this could involve working with other ecological experts to understand potential inter-species and intra-species competition pressures.

Principle 9. Apply existing knowledge and share lessons learnt

Apply existing knowledge, designing and implementing ecological restoration projects based on sound scientific principles and supported by good evidence to mitigate risk. Lessons learnt (both what went right and what went wrong) should be shared with the wider industry to help inform future schemes to mitigate risk.

Principle 10. Optimise wider benefits and ecosystem services

Optimise wider benefits and ecosystem services, particularly those related to climate change such as carbon sequestration and flood amelioration, generated by ecological restoration projects. In addition to benefiting biodiversity, designs should consider wider environmental, social and economic benefits that can be achieved. Sustainability and nature-based solutions should be integrated into designs.

Cover Photo: Penny Anderson

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