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Europe's Nature Restoration Law has now been adopted. What comes next?

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Oikos
2025: e11209
doi: 10.1111/oik.11209
Subject Editor: Pamela Graff
Editor-in-Chief: Pedro Peres-Neto
Accepted 3 February 2025

The European Union has recently adopted the Nature Restoration Law to address the widespread degradation of ecosystems. A key concern now is how effectively the law will be implemented across member states. We highlight the potential of spontaneous ecological succession (unassisted restoration) as a viable method for ecosystem restoration, often overlooked in favor of active restoration approaches. Analysis of 530 global studies and 156 European studies found that spontaneous succession succeeded in restoring natural or semi-natural vegetation in 60 and 67% of cases, respectively. This passive restoration approach, when applied under suitable conditions, can effectively recover degraded or destroyed ecosystems while being cost-efficient. We argue that the ecological benefits of spontaneous succession should be more widely considered in restoration projects.

Keywords: Nature Restoration Law, passive restoration, spontaneous succession

Introduction

Recently, on 17 June 2024, the Council of the European Union officially approved the Nature Restoration Law (NRL). With over 80% of European habitats in poor condition, the NRL seeks to reverse this degradation by restoring ecosystems across all member states. This is the pivotal step towards meeting the European Union's (EU) climate and biodiversity objectives. This law mandates that the EU restore at least 20% of its land and sea areas by 2030, with an ambitious goal to restore all ecosystems in need by 2050. Each member state is required to submit a national restoration plan within two years, and the plan must be regularly updated. NRL is the first continent-wide, comprehensive law aiming to deliver comprehensive ecological recovery.

The NRL is a key element of the EU Biodiversity Strategy for 2030 (https://environment.ec.europa.eu/strategy/biodiversity-strategy-2030_en), which sets binding targets to restore degraded ecosystems, in particular those with the greatest potential to capture

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and store carbon and to prevent and reduce the impact of natural disasters. In particular, the law considers restoration of critical habitats such as wetlands, rivers, forests, grasslands and marine ecosystems. By doing so, it aims to enhance biodiversity, improve water and air quality, boost pollination of crops and provide natural defenses against floods and drought episodes. Consequently, the NRL may help mitigate the effects of climate change. For more details, visit the official EU website: https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-law. The full text of the law is available at: https://eur-lex.europa.eu/legal-content/CS/TXT/?uri=OJ:L_202401991. For a broader context on the adoption of the NRL see Cliquet et al. (2024).

The approval of the NRL is an essential step that promises to help remedy the damaged nature of Europe, but now there is the matter of how this law will be implemented in individual member states. A key concern is that many activities may be labeled as 'restoration' without adhering to ecological principles. For example, there is a risk of monocultures of exotic species being planted in areas devastated by bark beetle infestations, or the sowing of species-poor commercial seed mixtures to convert large arable fields into grasslands. Such practices, including the introduction of invasive alien species, must be strictly avoided, and restoration efforts must be closely monitored to ensure their ecological integrity. Here, we would like to emphasize the great potential of natural processes, namely spontaneous (i.e. unassisted) ecological succession that represents spontaneous or passive restoration, to help restore degraded, damaged or destroyed ecosystems (Gann et al. 2019). Until now, active restoration has been the dominant approach, but the benefits of passive restoration have often been overlooked.

Material and methods

We analyzed the effectiveness of spontaneous succession in achieving restoration targets, often aligning with potential natural vegetation. The previous analysis, which encompassed 530 studies across various terrestrial ecosystems (Prach and Walker 2020), demonstrated that spontaneous succession was fully successful in 60% of cases, partially successful in 33%, and unsuccessful in only 7%. We used the following criteria for the evaluation of success: Fully successful – spontaneous recovery of the respective potential natural vegetation or another state appreciated from the restoration point of view, having natural or semi-natural species composition. In addition, composition and continuous vegetation cover were evident within several decades (≤100 years) and participation of weeds and/or invasive alien species was unimportant in the late successional stages. Partly-successful – partial recovery of the target as defined above; besides the desired target species, some weedy and/or invasive alien species participated in the late successional stages but did not dominate, and recovery of the target state was expected to take a long time > 100 years. Unsuccessful – undesirable weedy and/or invasive alien species dominated in later successional stages, and trends to the recovery of a target stage were not evident during several decades, or sparse or no vegetation developed due to extreme site severity or instability.

Results

Recently, we carried out a comparable analysis just for Europe (for the included studies see the Supporting information). We examined 156 studies ranging from the Mediterranean to high Arctic regions and including predominantly succession in abandoned agricultural lands and various sites disturbed by mining activities but also taking into account all other types of disturbed sites where succession started from the beginning and was sufficiently described. The success or failure of spontaneous succession (i.e. passive restoration) was comparable in this recent European study to our previous worldwide analysis, reaching 67% of studies fully successful, 27% partially successful and only 6% unsuccessful (Fig. 1).

Discussion

We demonstrated a slightly higher success of spontaneous succession in Europe than in the worldwide analysis, which can be attributed to the fact that Europe is located at higher latitudes where the succession generally fares better compared to lower latitudes (Prach and Walker 2020, Janečková et al. 2024). These data suggest that spontaneous ecological succession (passive restoration) is often a viable and effective method for restoring

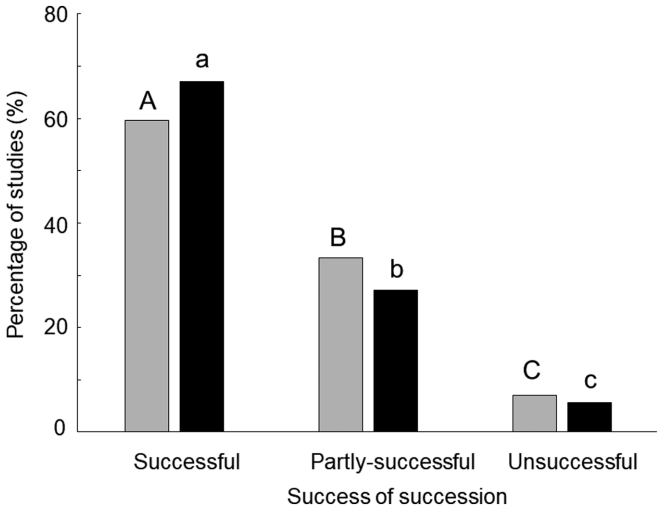

Figure 1. Proportions of the success or failure of spontaneous succession (i.e. passive restoration) reported by 530 studies worldwide (grey) and 156 studies from Europe (black). No difference was found between the World and Europe studies using Wilcoxon rank-sum test with continuity correction (W = 44 126, p-value = 0.101)> Wilcoxon test with pairwise comparisons on proportions (W = 5050, p-value < 2.2×10^{-16}) was used separately for both regions. Different letters indicate significant differences between the success categories.

European ecosystems. A pan-European analysis of long-term restoration projects presented by Reis et al. (2024) showed that passive restoration was used in only 12% of the cases while its potential is much higher as shown here. However, it should be emphasized that our results provide only a generalized framework suggesting the importance of exploiting natural processes in restoration. In any particular case, the local site and landscape conditions of an individual damaged, degraded or destroyed ecosystem must be taken into account to design an exact restoration program tailored to the particular site (Chazdon et al. 2021). Exploiting natural processes in restoration can improve species diversity, ecosystem function and ecosystem services (Bullock et al. 2011). Moreover, relying on natural processes is less expensive than many more intensive, technical restoration approaches. The Nature Restoration Law provides a good opportunity to reevaluate how to most effectively restore European ecosystems.

Acknowledgements – Open access publishing facilitated by Jihoceska Univerzita v Ceskych Budejovicich, as part of the Wiley – CzechELib agreement.
Funding – The study was supported by the European Union Horizon Scheme (project Wildcard no. 101081177) and by the Academy of Sciences of the Czech Republic (RVO project no. 67985939).

Author contributions

Karel Prach: Conceptualization (equal); Data curation (equal); Formal analysis (supporting); Funding acquisition (lead); Investigation (equal); Methodology (equal); Project administration (supporting); Resources (equal); Software (supporting); Supervision (lead); Validation (equal); Visualization (supporting); Writing – original draft (lead); Writing – review and editing (equal). **Petra Janečková**: Conceptualization (supporting); Data curation (lead); Formal analysis (lead); Funding acquisition (supporting); Investigation (supporting); Methodology (equal); Project administration (lead); Resources (equal); Software (equal); Supervision (supporting); Validation (equal); Visualization (lead); Writing – original draft (supporting); Writing – review and editing (equal). **Lawrence R. Walker**: Conceptualization (equal); Data curation (equal); Formal analysis (supporting); Funding acquisition (supporting); Investigation (equal); Methodology (equal); Project administration (supporting); Resources (equal); Software (supporting); Supervision (equal); Validation (equal); Visualization (supporting); Writing – original draft (supporting); Writing – review and editing (equal).

Data availability statement

Data are available from the Dryad Digital Repository: https://doi.org/10.5061/dryad.9kd51c5v3 (Prach et al. 2025).

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