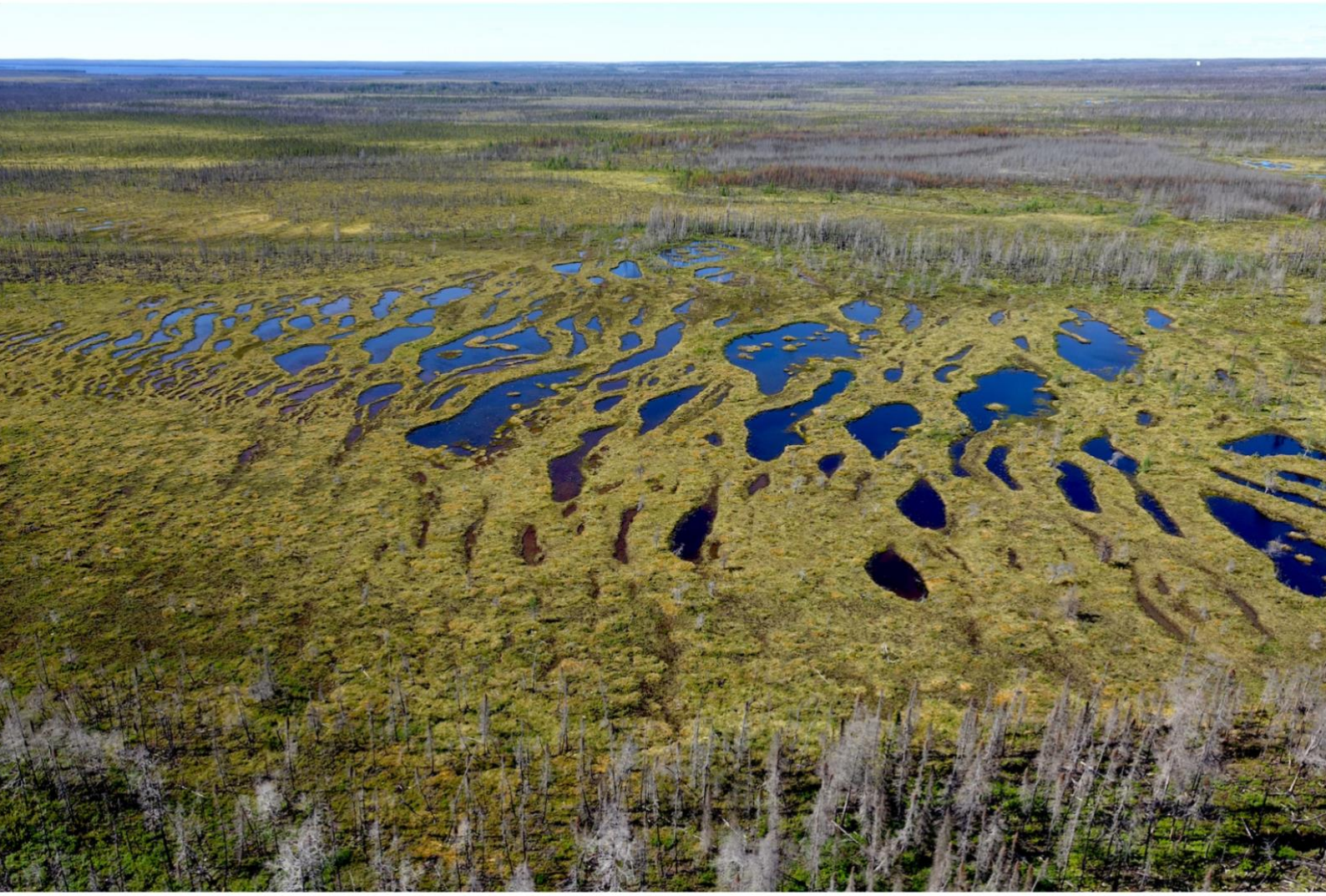

RESTORING PEATLANDS: Evidence-based insights for policymakers

EU NATURE RESTORATION LAW

Written by:
The EGU Biodiversity Task Force

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Executive Summary

- Restoring peatlands not only has the potential to promote biodiverse ecosystems but also to mitigate climate change, improve soil health, increase the resilience of ecosystems to extreme weather events, and increase agricultural productivity.
- Despite the extensive, empirically supported benefits, only 11% of peatlands are reported to be in good condition by EU member states. Given the scientifically substantiated benefits, establishing targets for their restoration presents a clear opportunity to support a multitude of policy targets previously set by the EU.
- The EGU Biodiversity Task Force therefore believes that the restoration of peatlands should be prioritised, with specific targets included in the Nature Restoration Law.
- During the restoration of peatlands, the responsibilities of different Member States, expert consultation, and ongoing monitoring and maintenance should be considered.

Despite their high environmental, economic, and social importance, more than 50% of European peatlands have been lost or converted [1]. The anaerobic conditions created by waterlogged peatlands slow the decomposition of organic material which allows carbon to be accumulated and stored in the soil over time. As a result, healthy peatlands are both critical for Europe's biodiversity and vital for the EU's climate mitigation targets, with peatlands storing nearly 30% of all soil carbon despite only consisting of 3% of the Earth's land surface [2]. Furthermore, peatlands purify water, support healthy soils, serve as a sponge in landscapes and hence mitigate the impacts of flood, drought and fire, and can also reduce erosion [3]. While restoring and rewetting peatlands may impede the use of some agricultural land, the overarching benefits to the climate, biodiversity, and soil health has the potential to promote long-term sustainable agricultural systems [4]. Despite the benefits of healthy peatlands and 33,000 km^2 of peatlands being protected under the EU Habitats, Member States report that only 11% of all peatlands are in good condition [5].

Given the extensive scientific evidence demonstrating the importance of peatland ecosystems, the EGU Biodiversity Task Force believes that targets for their restoration should be included in the Nature Restoration Law. Scientific evidence relating to both the multifaceted benefits of peatland restoration and the considerations that should be taken into account during their restoration are outlined below.

The Mutual Benefits of Peatland Restoration

	Scientific evidence
Biodiverse ecosystems	The hydrological and chemical conditions created by peatlands support a high species diversity [1, 6]. Furthermore, the ecosystem services provided by peatlands, as described in the rest of the table below, support the health and resilience of ecosystems that are essential for biodiversity and their surrounding areas, including nearby agricultural zones [6, 7].
Climate mitigation	Peatlands provide the most efficient carbon storage among all terrestrial ecosystems. Despite covering only 3% of global land area, peatlands hold 30% of all soil carbon, surpassing the carbon sequestered and stored in the world's forest biomass [2, 7]. Despite this, only 11% of peatlands are reported to be in favourable conditions by Member States [1, 5]. It should also be noted that postponing the rewetting and restoration of peatlands increases the amount of CO_2 emissions released from these degraded ecosystems [8]. Drained and degraded peatlands in the EU are estimated to emit 220 mega tonnes of CO_2 equivalent per year (approximately 5% of total EU emissions) due to the microbial decomposition of the peat and subsequent release of stored carbon [3]. Therefore, while peatland restoration has the potential mitigate climate change, postponing peatland restoration is likely to be actively detrimental to climate mitigation efforts, making the EU targets more challenging to reach.
Soil health	Peatland rewetting can support the recovery and restoration of diverse microbial communities in the soil. These microorganisms play crucial roles in nutrient cycling, organic matter decomposition, and the formation of stable soil aggregates [9]. Furthermore, the slower organic matter decomposition that results from rewetting peatlands can also counteract the soil acidification caused by peatland drainage [10]. This creates more favourable conditions for nutrient availability and microbial activity that can support the growth of a diverse range of plant species, helping promote better soil structure and a favourable environment for long-term agricultural productivity.
Resilience to extreme weather events	Restoring peatlands has the potential to minimise the impact and damage caused by floods by functioning as a hydrological sponge which retains and regulates water flow. Rewetted peatlands have a higher capacity to store water, improve water filtration processes and water quality, and release water slowly. This minimises surface runoff during periods of heavy rainfall and floods [3] and increases the availability of water during droughts [7]. With peatlands serving as a wet refuge for wildlife during periods of droughts, these effects are especially relevant when facing a climate of larger extremes and biodiversity decline. Additionally, drained peatlands are prone to fire due to the high soil carbon content [3]. While wet peatlands have the opposite effect, serving as fire breaks due to the wet surface conditions. This is a vital quality considering the increase in wildfire risk as a result of climate change [11].
Agricultural productivity	The potential benefits of peatland restoration outlined above, including soil health, nutrient retention and cycling, water regulation, and resilience to drought, fire and other extreme weather events, can all support greater agricultural productivity [9, 3, 7]. Conversely, non-restored peatland areas may adversely impact agricultural production by promoting land subsidence which may result in higher drainage expenses, greater flooding, drought and fire risk, and, ultimately, the loss of arable land [12]. Furthermore, the drainage and degradation of peatland has the potential to lead to soil erosion and land desiccation, soil instability, and stronger water table [10].

Considerations

While there are many benefits of peatland restoration, as listed above, there are also some critical points that should be taken into account in any policy decision regarding their restoration.

Different Member State responsibilities

While peatlands cover 7.7% of the land surface in Europe, their concentration differs widely between Member States, with Northern, Eastern and Central Europe countries having the highest concentration [13]. The implementation of restoration measures should therefore consider the different responsibilities that each member state has.

Expert consultation

It is essential for scientific experts to be consulted during the restoration of peatland ecosystems. This will enable the condition of the peatland ecosystem, the origin of the degradation, specific tipping points [14], and the steps and resources needed to restore the area, to be identified. Using scientific expertise to support the restoration process will enable efforts to be tailored to the specific ecosystem, for resources to be used strategically, and restoration measures to be as effective as possible. If resources are limited, these experts could also assist with prioritising peatland restoration efforts to select those that provide the greatest ecosystem benefits while requiring the least amount of active maintenance.

Ongoing monitoring and maintenance

Member States should have a good understanding of the ecosystem functioning, eco-hydrological processes, and use knowledge-based restoration strategies to ensure that most effective restoration measures are implemented, and targets can be met. The impact of rewetting peatlands on carbon storage depends on the microbial communities, vegetation, and stabilisation of appropriate hydrological conditions. Not only can the re-establishment of such conditions take several years or decades to achieve, but it may also not be maintained if the conditions of the peatland change due to external factors (such as climate change and neighbouring land use). Furthermore, new peat accumulation, and subsequent increases to hydrological buffering and water storage capacity, can take decades to develop after the peatland has been rewetted [15, 16, 17]. It is therefore important that Member States maintain the favourable conservation status of restored peatlands and establish long-term peatland monitoring systems to ensure their benefits are reaped.

Summary

As an active member within Europe's scientific community, the EGU Biodiversity Task Force supports evidence-informed policymaking in Europe. The Task Force acknowledges that the Nature Restoration Law exhibits a particularly high level of interconnection and complexity, and consequently many stakeholders and nuanced factors need to be considered. However, within this, the role of scientific evidence cannot be understated in both bringing clarity to these complex policy discussions and when considering the potential outcomes of policy decisions. Evidence shows that the restoration of peatlands has the potential to contribute significantly towards biodiverse ecosystems, climate mitigations, soil health, resilience to extreme weather events and agricultural productivity. Thus, as the biodiversity taskforce we encourage the restoration targets for these ecosystems to be included in the Nature Restoration Law, and for their proper restoration and long-term monitoring to be an ongoing priority.

About the EGU Biodiversity Task Force

As Europe's largest geoscience society, the European Geosciences Union (EGU) is uniquely positioned to facilitate the transfer of knowledge from research into practice and to connect policymakers to the most relevant geoscience experts. In early 2022, EGU's Science for Policy Working Group created the EGU Biodiversity Task Force to bridge the gap between science and policy, delivering scientific information and expertise to where it is most needed. The Task Force has previously provided recommendations informed by scientific evidence to strengthen the EU Nature Restoration and is also available to support policymakers on both a European and Member State level by answering evidence-based questions, translating scientific research, participating in meetings, writing fact sheets, and providing summary documents to help policymakers understand the legislative relevance of ground-breaking geoscience research. For further information, please contact policy@egu.eu.

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Created by the EGU Biodiversity Task Force Members

EGU Biodiversity Task Force Members:

Felicia Akinyemi
Viktor Bruckman
Rita Carrasco
Bikem Ekberzade
Adam Izdebski
Annegret Larsen
Maria Polo
Adriano Sofo

Chloe Hill, EGU Policy Manager

More information: https://www.egu.eu/policy/biodiversity/