Natural grazing is a key ecological process that helps a myriad of species of half-open landscapes, and supports natural and mosaic forest landscapes less prone to fire.

Ecological restoration in the EU post-2020 biodiversity strategy: The opportunities of rewilding European landscapes for nature and climate

The biodiversity and climate change crises and the benefits of ecological restoration

We currently face two global environmental crises: biodiversity loss and climate change. The global assessment of the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES) estimated that 1 million species are threatened with extinction with looming consequences for ecosystem services on which humans depend[1]. At the same time the Intergovernmental Panel for Climate Change has alerted that, unless urgent action is taken, global warming greater than 1.5°C within 3 decades is unavoidable[2].

Although these two crises are often considered separately, many of the underlying causes are interlinked and related to unsustainable development. As such, some of the solutions to these two crises involve complementary and synergistic measures. In particular, climate change mitigation and adaptation require better management of biodiversity.

Nature-based solutions such as forest restoration could sequester up to two thirds of the CO_2 accumulated emissions in the atmosphere[3], contributing decisively to limit global warming below 1.5°C, but these efforts will only be effective if directed towards restoring natural, biologically complex and self-sustained forests[4]; single-species plantation forestry often damages existing biodiversity and can be more prone to wildfire and disease.

1 IPBES, 2019. IPBES Global Assessment Summary for Policy Makers. https://ipbes.net/sites/default/files/inline/files/ipbes_global_assessment_report_summary_for_policymakers.pdf

2 IPCC, 2018. Summary for Policymakers. Global Warming of 1.5°C. https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf

3 Bastin et al., (2019). The global tree restoration potential. *Science, 365*(6448), 76-79.

4 Lewis et al., (2019). Restoring Natural Forests Is the Best Way to Remove Atmospheric Carbon. Nature 7750:25-28

Natural peatlands provide a dense carbon store: 20% of all global soil carbon on just 3% of land surface - equivalent to 450 gigaton... (photo: intact peatland in Swedish Lapland).

...however at least 50% of the world's peatlands are damaged – which can be rewetted and become a sink again, in a relative cheap way (photo: damaged peatland in Finland).

Peatlands are a dense store of carbon that naturally sequester carbon from the atmosphere (negative emissions) laying that carbon down as peat. In Europe, however, peatlands are mostly damaged through drainage, peat extraction, forestry and/or burning causing the peat to dry and oxidise. They now act as a source of CO_2 to the atmosphere rather than as a sink. Rewetting and the restoration of natural function of peatlands offers a cost-effective mitigation approach[5].

An additional benefit is that restoring resilient ecosystems will help us to adapt to climate change and moderate climate risks; examples include:

- Land-use planners and ecologists are reconnecting rivers to natural floodplains to absorb increased incidents of flooding.
- Similarly, the protection and restoration of upland landscapes (mires, heaths, woodland and grasslands) create hydrologically 'rougher' surfaces that impede the flow of storm-water into streams, reducing flood peaks in downstream towns and cities and make urbanised floodplains far safer places to live and work.
- Wild grazing provides a cheap way of reducing combustible biomass from dry-forested landscapes significantly reducing fire risk as droughts become longer and more extreme.
- Coastal wetlands can significantly reduce the impact of increased storminess by reducing the energy of wave action during storms, reducing the impact of coastal flooding and erosion.
- Healthy ocean ecosystems are necessary to address carbon storage and ensure their resilience to the effect of climate change.
- Urban trees counteract heat islands in cities[6].

Additionally, the latest biodiversity scenarios indicate that, unless the climate crisis is promptly addressed, climate change will become a major cause of species extinction by the middle of the century, further exacerbating biodiversity loss and associated contributions to human well-being[7].

Bringing back nature to the EU in the post-2020 biodiversity strategy

Rewilding European ecosystems, through the restoration and maintenance of ecologically functional and connected landscapes, wetlands and floodplains, is of the utmost importance to achieve the objectives of the Birds and Habitats Directives and the Water Framework Directive. It will be necessary to bend the curve of biodiversity loss[8] and bring back nature in Europe in the years to come. The EU's Biodiversity Strategy to 2020 aimed to "restore at least 15 % of degraded ecosystems". The mid-term evaluation of the EU Biodiversity Strategy made it clear that progress on this target has been largely insufficient[9]. Also, the

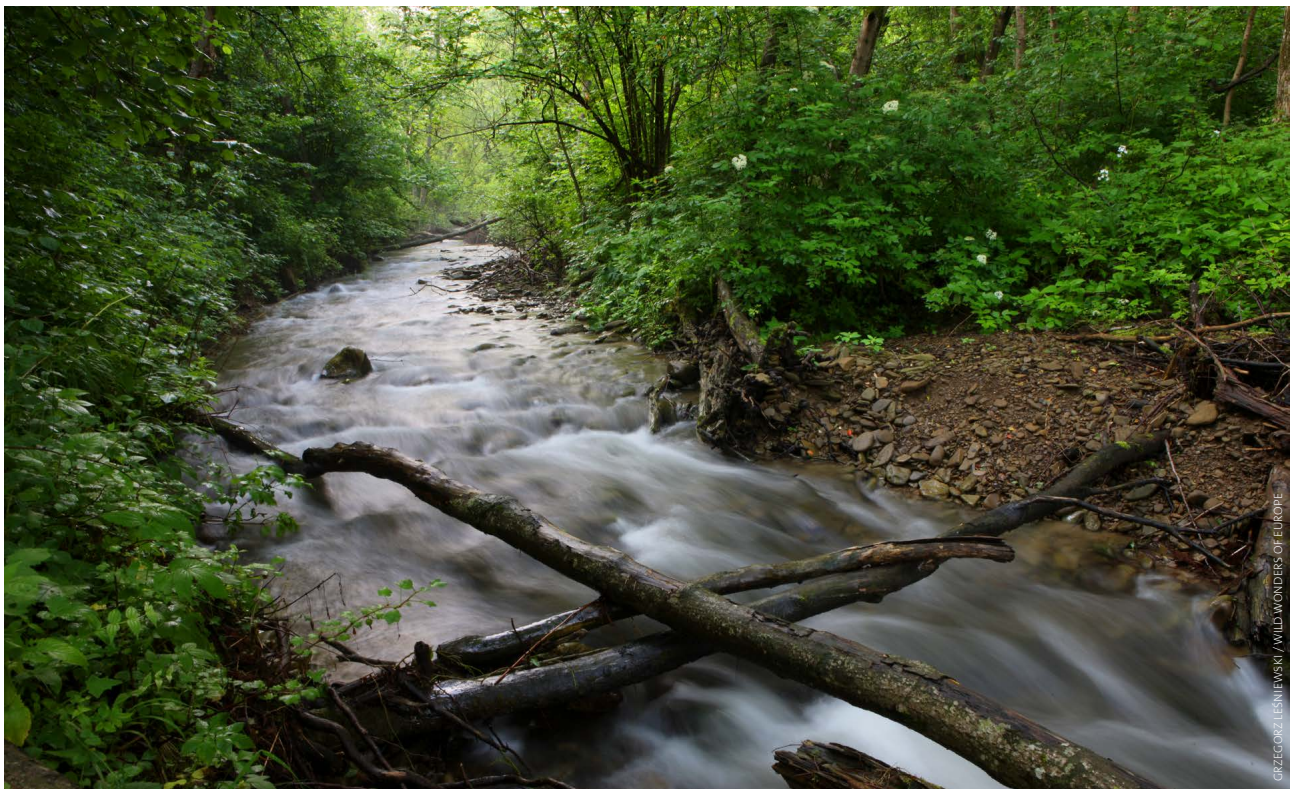
5 Joosten et al., (2016). The role of peatlands in climate regulation. In: Bonn et al., (eds). *Peatland Restoration and Ecosystem Services*. Cambridge University Press.

6 European Commission. (2015). Towards an EU Research and Innovation policy agenda for Nature-based Solutions & re-naturing cities. Horizon 2020 Expert Group. http://ec.europa.eu/newsroom/horizon2020/document.cfm?doc_id=10195

7 Pereira, H. M., et al. 2010. Scenarios for Global Biodiversity in the 21st Century. Science 330:1496–1502.

8 Mace, et al (2018) Aiming higher to bend the curve of biodiversity loss. Nature Sustainability, 1, 448–451.

9 European Commission (2015): Mid-term review of the EU Biodiversity Strategy to 2020. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0478



Natural rivers help retention of rainwater upstream, avoiding flooding of downstream areas…(photo: Southern Carpathians, Romania).

fitness check of the EU Nature Directives pointed to the lack of connectivity of the Natura 2000 network as one of the main implementation gaps[10].

Large scale nature restoration will contribute significantly to:

- Tackle our biodiversity AND climate crises as such;
- Improve both the conservation status and the connectivity of the Natura 2000 network and hence contribute to halting the loss of biodiversity;
- Protect and restore carbon stocks, hence help stabilizing the climate below a 1.5° C rise in average global temperatures and hence avoid climate impacts/adapt to a changing climate.

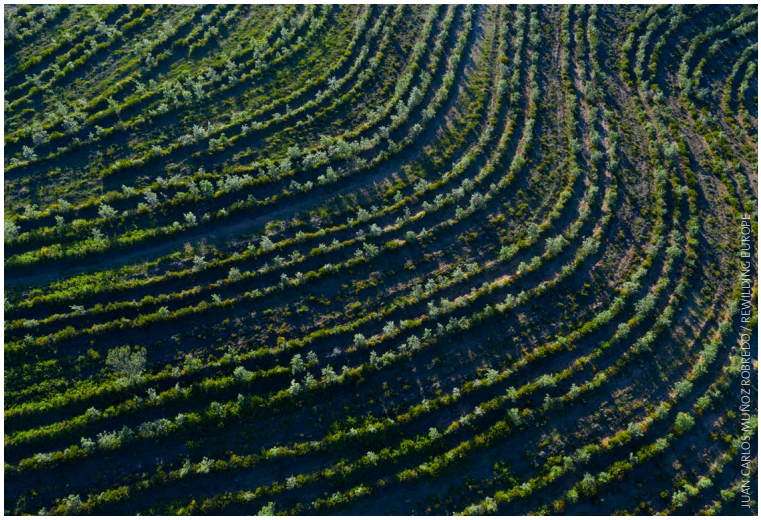
…while artificial drainage systems release water too fast and lower groundwater tables (photo: Oder Delta, Poland)

The European Commission should therefore propose, in its upcoming Biodiversity Strategy, nature restoration legislation that ensures that nature can be brought back to the EU at the large-scale. For this, the European Commission needs to present a proposal that includes the following elements:

- A legally binding targets for Member States to increase the area of habitats in good ecological condition, through restoration of natural forests, peatlands, floodplains, wetlands, biodiversity rich grasslands, coastal zones and marine areas. This restoration target must set a concrete number of ha/km^2 and must be legally binding. Planned afforestation in the context of the restoration agenda should be focussed on urban forest planting of native species and facilitating natural regeneration elsewhere.
- Ensure that any financing for climate action delivers active restoration of habitats on land and at sea.

10 European Commission (2016). Fitness check of the EU Nature Legislation (Birds and Habitats Directives). https://ec.europa.eu/environment/nature/legislation/fitness_check/docs/nature_fitness_check.pdf

Natural and old-growth forests store large carbon stocks and have huge biodiversity values... (photo: Velebit Mountains, Croatia)



... while single-species plantation forestry often damages existing biodiversity and is more prone to wildfire and disease (photo: oak plantation, Greater Côa Valley, Portugal)

Authors

Henrique M. Pereira[1], Nestor Fernandez[1], Andrea Perino[1], Josiane Segar[1,2], Frans Schepers[2] and Rob Stoneman[2]

1 – German Centre for Integrative Biodiversity Research iDiv, Leipzig-Halle-Jena; Institute of Biology, Martin Luther University Halle-Wittenberg

2 – Rewilding Europe

Rewilding offers an effective approach to help achieve these targets. Rewilding is a form of ecological restoration that promotes self-sustained ecosystems able to provide important services to people and nature while requiring minimum human management in the long term. Critical components of rewilding include restoring the ecological role of wild species and their interactions, enhancing connectivity within and among habitats and promoting natural vegetation succession and ecosystem regulation[11]. Ecological restoration according to rewilding principles can enhance across ecosystem types the provision of a wide range of services to people, such as carbon sequestration, nutrient and water retention, healthy aquatic systems, as well as recreation and experiencing nature[12]. In many rural areas with increasingly depressed economies, rewilding can create opportunities for new businesses such as ecological restoration, wildlife watching and sustainable use of natural resources.

Ecosystems managed this way, and therefore regulated by natural processes, require no or very low management costs relative to systems dependent on constant human intervention[13]. The costs of ecosystem restoration are one of the main barriers to the effective implementation of restoration initiatives over large scales, and a contributing factor to why the EU is currently falling short on its target of restoring 15% of degraded systems by 2020. Restoring self-sustaining, functioning ecosystems can help reduce the costs of creating a coherent ecological network and increase the scale over which restoration can be applied.

Indeed, rewilding often spontaneously occurs in areas where no other land management is present (e.g. where land is no longer used for agriculture). For instance, the amount of forests and shrublands is now increasing in Europe as some agricultural areas became uneconomic during the twentieth century[14], for example in the post-socialist Carpathians, where large areas of land were no longer farmed allowing the natural recovery of the ecosystem[15]. This example adds to the growing network of rewilding and large landscape restoration initiatives across Europe that include rivers and floodplains, open landscapes, forests, peatlands and mountainous areas. In all these initiatives, conditions are created for natural processes such as spontaneous forest regeneration, wildlife comeback, restoration of natural flooding regimes, erosion and sedimentation, natural grazing and many more.

Ecological restoration according to rewilding principles thus provides new opportunities for managing land that is otherwise economically unproductive in a manner that is cost-effective and delivers a suite of ecosystem services of benefit to people and the environment.

11 Perino, A., et al. (2019). Rewilding complex ecosystems. Science, 364(6438), eaav5570.

12 Cerqueira, Y., et al (2015) Ecosystem services: the opportunities of rewilding in Europe. *Rewilding European Landscapes* pp. 47–64. Springer, Cham.

13 Birch, J. C., et al. (2010). Cost-effectiveness of dryland forest restoration evaluated by spatial analysis of ecosystem services. *Proceedings of the National Academy of Sciences*, 107(50), 21925-21930.

14 Kaplan, J. O., et al. (2009) "The Prehistoric and Preindustrial Deforestation of Europe." Quaternary Science Reviews 28, 27–28, 3016–34.

15 Turnock (2002). Ecoregion-based conservation in the Carpathians and the land-use implications. Land Use Policy, 19, pp. 47-63.