The Trophic Rewilding of Large Terrestrial Herbivores as a Climate Change Mitigation Strategy

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Rewilding is a conservation tool that involves the (re)introduction of fauna and / or flora species into an area to create a self-sustaining ecosystem. It is often used to increase biodiversity and protect endangered species, by reinstating areas of wilderness that can operate without human management. However, it is also being increasingly considered as a climate change mitigation and adaptation tool, since it can increase an ecosystem's resilience and carbon storage capacity. Because of this, it can be argued that leading authorities should use rewilding in their fight against the climate emergency, in tandem with other approaches and without ignoring rewilding's importance as a conservation tool. The Global Rewilding Alliance suggests that carbon uptake (i.e. sequestration of carbon from the atmosphere) can be increased by 1.5 to 12.5 times by the rewilding and conservation of vertebrate and invertebrate species worldwide.

There are multiple approaches to rewilding, from differences in basic ideologies to species and location choice, largely dependent on the rewilding initiative's purpose. The literature that exists on the (relatively new idea of) use rewilding as a climate change mitigation tool largely focuses on the potential of the trophic rewilding of large terrestrial herbivores.[1]

Trophic rewilding involves the restoration of an ecosystem's trophic (i.e. food-web) interactions, encouraging the return of their associated ecosystem functions and services. Large herbivores are keystone species that play an important role in the trophic web of ecosystems worldwide, with impacts on all aspects of their environment, including those influencing climate change such as carbon storage, surface albedo, and wildfire regimes. For instance, following a fire in 2003 that caused widespread damage to Faia Brava (Portugal's first private reserve), the reserve's founders Transhumance and Nature Association opted to begin rewilding the ecosystem with large herbivores, such as Garrano ponies and Maronesa cattle. These species cleared flammable forest material from the area, and helped to restore the ecosystem's ecological processes,[2] making the reserve more self-managing. Thus, introducing specific species of large herbivores in carefully calculated population sizes to certain environments can have a positive climate change mitigation potential. And, alongside the climate-positive benefits, such populations will make ecosystems more self-managing, which is key for successful species conservation.[3]

Yet, there are risks due to the (often hidden) complexity of large herbivores' ecosystem impacts, and if done incorrectly then rewilding can lead to unexpected negative consequences. There are also barriers to the successful implementation of rewilding,

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[1] *see*, e.g., Svenning, Jens-Christian, et al. "Trophic Rewilding: Ecological Restoration of Top-down Trophic Interactions to Promote Self-Regulating Biodiverse Ecosystems." *Rewilding*, Jan. 2019, pp. 73-98, or Bakker, Elisabeth S., and Jens-Christian Svenning. "Trophic Rewilding: Impact on Ecosystems under Global Change." *Philosophical Transactions of the Royal Society B: Biological Sciences*, vol. 373, no. 1761, Oct. 2018, p. 20170432, or Schmitz, Oswald J., et al. "Trophic Rewilding Can Expand Natural Climate Solutions." *Nature Climate Change*, vol. 13, no. 4, Apr. 2023, pp. 324-33.

[2] "Rewilding – the Natural Way to Minimise Wildfire Risk." *Rewilding Europe*, 24 Aug. 2020.

[3] It is key for species conservation that habitat management must not be generic or static (Sandom, Chris. "Rewilding – Implications for Nature Conservation." *ECOS*, vol. 37, no. 2, 2016, pp. 24–28; Webb, J. R., et al., "Natural England Research Report NERR024 Managing for Species: Integrating the Needs of England's Priority Species into Habitat Management." Part 1 Report. *Natural England Research Reports*, 15 Jan. 2010), and restoring ecological processes helps create these conditions in a self-managing way.

concerning the feasibility of performing it safely and sustainably on a scale with significant impact. For example, for an environment to be "truly" rewilded, it should function independent of human support, and so in this case would require the natural control of herbivore populations through the introduction of carnivores: an idea to which there is usually public reluctance.

Promisingly, interest in both rewilding and the effects of large herbivores on climate change are rapidly increasing. Rewilding groups are working together internationally, through collaborations such as the Global Rewilding Alliance, and with support from organisations like the United Nations during their Decade on Ecosystem Restoration. Rewilding has applications in the public health (from positively affecting mental well-being[4] to disease prevention[5]) and economic sectors,[6] and these perspectives may gather more funding and support than a conservationist approach alone. Trophic rewilding is a natural climate solution with the ability to drive negative carbon emissions and sustain them for over 100 years, as is necessary to prevent a 1.5-2°C rise in global mean temperature.[7]

[4] Svenning, Jens-Christian. "Rewilding Should Be Central to Global Restoration Efforts." *One Earth*, vol. 3, no. 6, Dec. 2020, pp. 657-60.

[5] Mills, Jacob G., et al. "Urban Habitat Restoration Provides a Human Health Benefit through Microbiome Rewilding: The Microbiome Rewilding Hypothesis." *Restoration Ecology*, vol. 25, no. 6, Oct. 2017, pp. 866-72.

[6] Lorimer, Jamie, et al. "Rewilding: Science, Practice, and Politics." *Annual Review of Environment and Resources*, vol. 40, no. 1, Nov. 2015, pp. 39-62.

[7] Schmitz (n 1) *supra*.