#GLFBiodiversity

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GLF Biodiversity Digital Conference

Rewilding as a biodiversity engine

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White paper

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Human-induced ecosystem degradation has led to a complex biodiversity crisis generating greater attention to the need for novel, science-based, ecological restoration strategies to foster resilience. One such innovative method that has captivated interdisciplinary audiences and experts in the field is the use of trophic rewilding, which includes the introduction of lost species that can 're-establish' trophic interactions and associated trophic cascades to promote self-regulating, biodiverse ecosystems. These functions have been lost due to the global decline of species – especially large herbivores and carnivores.

Trophic rewilding initiatives are being developed to restore ecosystem functions all over our planet. From the proactive conservation model demonstrated by the Iberá Rewilding Program in Argentina, to invasive species management via reintroduction of Tasmanian devils as apex predators in Australia, and the reintroduction of bison and wild horses as keystone species in European ecosystems. In Europe the expansion of Eurasian beavers across wetlands has enabled us to examine how to use the beaver's innate restoration traits to improve biodiversity, and many more projects focusing on the reintroduction of wildlife species – especially large herbivores – are underway.

As a result of their size, which entails a very intensive use of resources, megafauna have the ability to impact and transform our ecosystems on a larger scale than smaller animals. The impacts of megafauna on ecosystems can be divided into five broad categories, although all of them are interconnected and influence each other.

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Why megafauna are ecosystem engineers

Rewilding promotes ecosystem recovery and restores food chains and trophic cascades. This involves restoring populations of “keystone species” that have been lost.

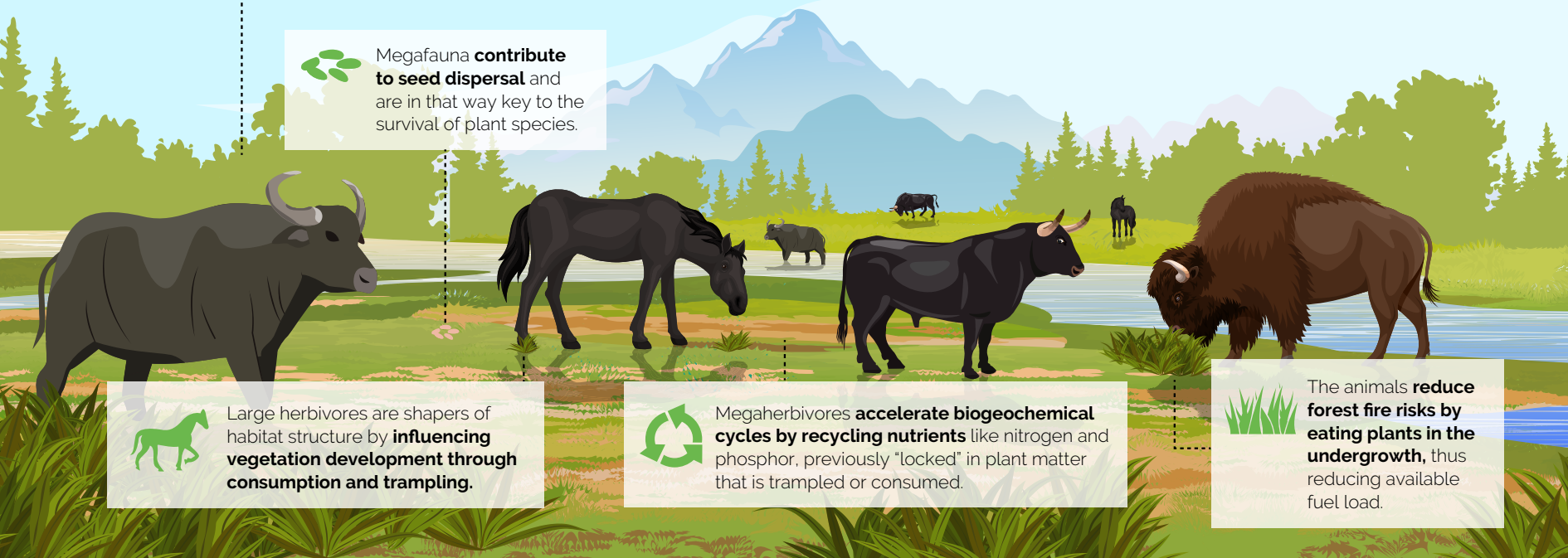
The impact of megafauna determines which plant species will thrive in an ecosystem, in that way **influencing plant species composition in a landscape.**

Large herbivores can **influence processes that exacerbate or mitigate climate change,** through consumption and digestion, including the release of greenhouse gases such as methane.

Large herbivores help **create and maintain mixed semi-open forested landscapes.**

Megafauna create more complex ecosystems with more interspecies interactions and longer food chains, which in turn **makes ecosystems more resilient and less vulnerable for climate change.**

Megafauna **contribute to seed dispersal** and are in that way key to the survival of plant species.



Large herbivores are shapers of habitat structure by **influencing vegetation development through consumption and trampling.**

Megaherbivores **accelerate biogeochemical cycles by recycling nutrients** like nitrogen and phosphor, previously “locked” in plant matter that is trampled or consumed.

The animals **reduce forest fire risks by eating plants in the undergrowth,** thus reducing available fuel load.

Ecosystem physical structure

The first impact is the most direct: megafauna herbivores are shapers of habitat structure through influencing vegetation development. The physical structure of the landscape is changed through consumption and trampling by megaherbivores and large herbivores.

Megaherbivore activity plays a major role in suppressing woody vegetation, opening the habitat for grasses and forbs and creating savanna-like landscapes. The landscape structure is influenced by varying herbivore pressure on vegetation in different areas tied to water sources, steep slopes, migration routes, risk of predation, etc. This creates differentiated areas of trees, grasses and shrubs, which can be dynamic and vary through cyclic succession.

Ecosystem trophic structure

Megafauna, because of their large body mass and use of resources, play a major role in regulating the abundance and composition of the animal community.

Megaherbivores are major competitors for food with smaller herbivores, and megacarnivores exert an important population control through predation on smaller animals and young megaherbivores, as well as having an effect on prey behaviour through the ecology of fear.

Loss of megafauna can result in simpler ecosystems with fewer interspecies interactions and shorter food chains, which in turn makes the animal communities and ecosystems less resilient and more vulnerable to external pressures such as climate change.

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Vegetation community composition and diversity

As a result of the huge amount of pressure megafauna exert on vegetation, many plant species have developed adaptations to become browsing-tolerant and resistant to consumption by herbivores, such as thorns, chemical deterrents or thick bark. In this way, megafauna plays a major role in determining which plant species are more likely to thrive in an ecosystem and change the composition of the plant community.

Additionally, as they usually roam across vast tracts of land, megafauna facilitate long-distance seed dispersal, which may be vital when plant species need to modify their range to adapt to a changing climate or other conditions.

Ecosystem biogeochemistry

Another important role of megafauna is the acceleration of ecosystem biogeochemical cycles by liberating nutrients, previously "locked" in plant matter that is trampled or consumed, into the decomposition pool. This is especially important in poor soils and dry or cold climates, such as the mammoth steppes of Northern Eurasia, where nutrients became locked in slowly decomposing plant matter after the extinction of the mammoths and other megafauna and the landscape became a barren tundra.

Photo by True Nature Foundation

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Regional and global climate

Animals are influenced by climate, but is the climate also influenced by animals? Large herbivores can influence processes that exacerbate or mitigate climate change. Research is ongoing on how large-herbivore guilds impact vegetation development, seed dispersal, wild fire dynamics and nitrogen and phosphorus cycles. Through consumption and digestion, megafauna can have impacts on biogeochemical cycling, including the release of greenhouse gases such as methane. Since methane emissions scale with body size, the Pleistocene megafaunal loss is estimated to have had a global cooling effect of 0.08-0.2C.

Rewilding – a Call to Action

A recent synthesis of to-date available research on trophic rewilding has demonstrated its potential to mitigate a multitude of extinction, ecological restoration and climate change issues globally. To increase the likelihood of trophic rewilding being identified and recognized, i.e. becoming central to ecological restoration and climate change agenda-setting, an agreed set of references and methodologies concerning ecological restoration needs to be adopted by practitioners, funders, governments, researchers and organisations.

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The **Global Landscapes Forum** (GLF) is the world's largest knowledge-led platform on integrated land use, dedicated to achieving the Sustainable Development Goals and Paris Climate Agreement. The Forum takes a holistic approach to create sustainable landscapes that are productive, prosperous, equitable and resilient and considers five cohesive themes of food and livelihood, landscape restoration, rights, finance and measuring progress. It is led by the Center for International Forestry Research (CIFOR), in collaboration with its co-founders UN Environment Programme and the World Bank and Charter Members.

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