

Global study: Wild megafauna shape ecosystem properties

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An elephant, *Loxodonta africana*, throws dirt into the air in the tall grass of the savanna. Credit: Jeffrey T. Kerby

For millions of years, a variety of large herbivores, or megafauna, influenced terrestrial ecosystems. Among many others, these included

elephants in Europe, giant wombats in Australia, and ground sloths in South America. However, these animals experienced a wave of extinctions coinciding with the worldwide expansion of humans, leading to dramatic but still not fully understood changes in ecosystems. Even the survivors of these extinctions strongly declined, and many are currently threatened with extinction.

While there are many [case studies](#) as well as theories about the effects of [large animals](#), formal attempts to quantitatively synthesize their effects and establish generality have been lacking.

A new study, conducted by an international team led by researchers from Aarhus University and the University of Göttingen, published in *Nature Ecology & Evolution*, has gathered numerous individual case studies and analyzed the findings. They show that large animals have a variety of generalizable impacts—impacts that are likely missing from most of today's ecosystems.

The impact of large animals on ecosystems

Among the identified general impacts of large wild herbivores are shifts in soil and plant nutrients, the promotion of open and semi-open vegetation and the regulation of the population of smaller animals.

Moreover, one of the key findings of the studies is that megafauna promote ecosystem diversity by increasing the structural variability in the vegetation.

"The positive impact on variability in [vegetation structure](#) is particularly noteworthy, given that environmental heterogeneity is known as a universal driver of biodiversity. While our study mostly looked at the impact of megafauna on small scales, our findings suggest that they promote biodiversity even on the landscape level," says Aarhus

University Ph.D. student Jonas Trepel, who led the study.

Large herbivores change vegetation structure by consuming biomass, breaking [woody plants](#), and trampling smaller plants—impacts that are hypothesized to depend on the animal's body size. Given that the analyzed dataset spanned two magnitudes of body size (45-4,500 kg), the researchers were able to test specifically how this important trait shapes the impact of large animals.

They found, for example, that megafauna communities that include larger herbivores tend to have positive effects on local plant diversity, while communities composed of smaller species (e.g.

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