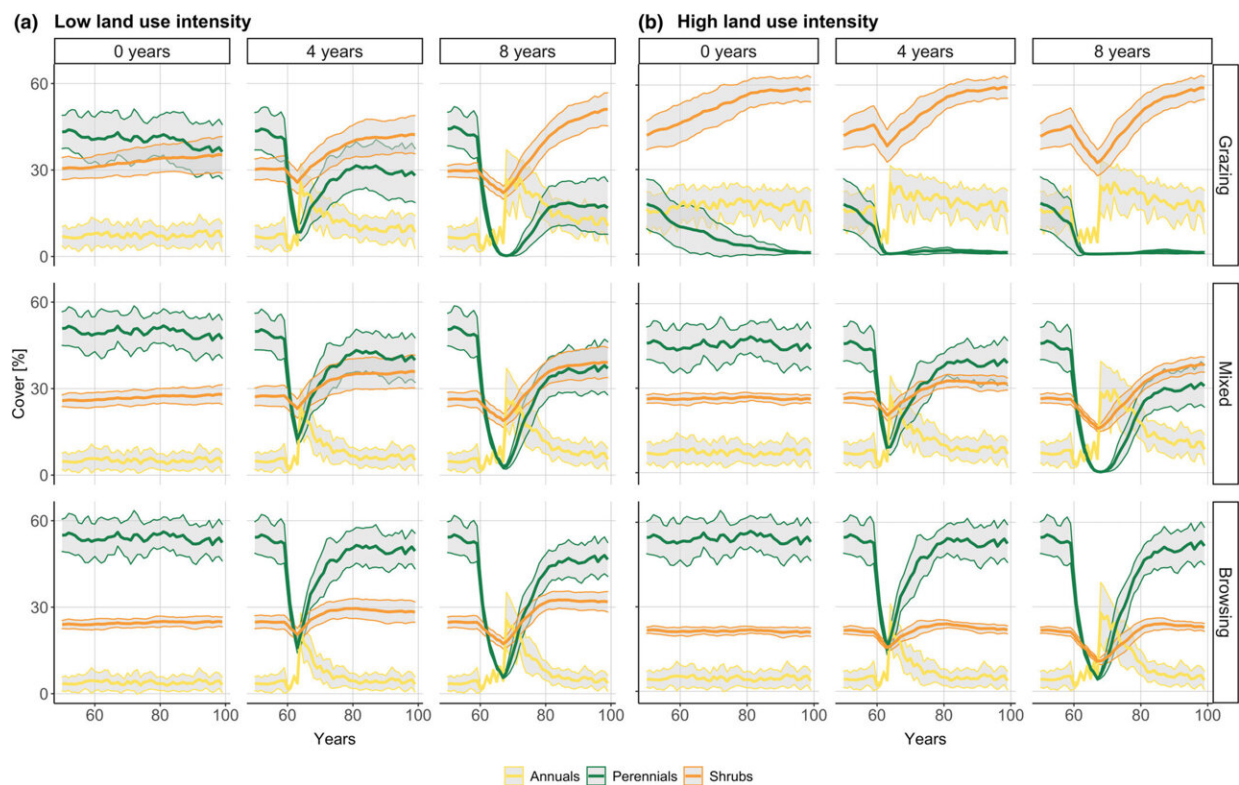


Browsing herbivores increase savanna resilience to droughts, study finds

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Change in vegetation cover over time and relating to rangeland scenario. Predicted mean cover \pm SD [%] of the three meta-PFTs (lines) under various drought period lengths for all rangeland use scenarios in two intensities (a,b). The numbers (0, 4, 8) at the top correspond to drought duration in years. All droughts began in the year 60. The graphs are shown from year 50 onwards. All simulations were repeated 30 times with varying climates. Credit: *Journal of Applied Ecology* (2023). DOI: 10.1111/1365-2664.14351

Extreme climate events pose an ever-increasing threat to savannas around the world. However, the ability of these mixed woodland-grassland ecosystems to resist periods of drought can be improved with a higher number of browsing herbivores—i.e., animals such as kudus, springboks, and common elands that feed on woody vegetation. These help increase the amount of plant diversity and thus the functionality of savannas, as Katja Irob, a biologist at Freie Universität Berlin, has now demonstrated.

Her article, entitled "Savanna Resilience to Droughts Increases with Proportion of Browsing Wild Herbivores and Plant Functional Diversity" was published in the *Journal of Applied Ecology* on January 31, 2023, as part of the German-Namibian collaborative project ORYCS.

Savannas are woodland-grassland ecosystems with low water availability. This makes them very susceptible to extreme climatic events. However, [savannas](#) provide a number of important ecosystem services, meaning that ensuring their ability to resist extreme events is essential.

"Climate change will have an increasingly negative impact on savanna systems due to the higher intensity and frequency of extreme climatic events such as droughts. This is particularly the case when droughts are combined with unsustainable rangeland management," says Katja Irob, a biologist at Freie Universität Berlin.

The highly variable rainfall and low water availability in savannas mean that these areas are often unsuitable for agricultural use. However, commercial livestock farming is an important source of income for the agricultural industry in southern Africa.

"Extensive livestock farming is somewhat flexible. It allows farmers to adapt to challenging, ever-changing environmental conditions and means that rangeland is the more economically secure option in years of

drought. However, we need to find a balance between economic sustainability and the ecological capacity of rangeland to recover," says Irob.

The results of the study also made it clear that savannas dominated by cattle ranching have an overabundance of shrubs and fewer grasses. This is because cows prefer to eat grasses and other herbaceous plants, giving shrubs a competitive advantage and thus more chance to grow. However, a diminished grass layer increases the risk of soil erosion, leading to lower productivity and alterations in the area's nutrient cycle and water balance.

New studies have already pointed out that reducing grazing intensity and introducing wild animals improves the resilience of an ecosystem and thus the way the land is used. Irob and her team took this information to formulate their own hypothesis: that a lower number of grazing animals (e.g., cattle, goats, sheep, and other herd animals such as zebras) and a higher number of browsers (e.g., kudus, common elands, oryx, springboks, rhinoceroses, and giraffes), which often consist of a diverse community of herbivores with a higher number of shrub-eating herbivores, leads to a more balanced ecosystem and thus increases the resistance of savannas to droughts.

Moreover, native wild animals could ultimately provide higher financial returns. This is because they are better adapted to unfavorable climatic conditions and more resistant to endemic diseases than cattle. Additionally, [wild animals](#) would provide an alternative to the production of red meat and their uniqueness would also allow for greater use in the tourism industry.

In the article, Irob explains that she and her team made use of the ecohydrological savanna model EcoHyD to determine whether the resilience of a savanna rangeland to prolonged droughts can be enhanced

by the choice of rangeland use type (grazer-dominated, mixed feeders, or browser-dominated) and animal density. This work was carried out under the leadership of Professor Britta Tietjen, head of the Theoretical Ecology Working Group at Freie Universität.

"Generally, we saw that the higher the number of grazing animals, the lower the resistance of the savanna to climatic events, like drought. Above all, we discovered that the functional diversification of herbivores and plants acted as a kind of insurance against droughts, leading to greater resistance and recovery of perennial grasses. This higher level of resistance was made possible by higher numbers of shrub-eating herbivores in particular," says Irob.

Diversifying the number of herbivores within a savanna system was shown to reestablish complexity within the food webs in place there. This meant that the area was better able to self-regulate, thus reducing the need for additional management interventions.

The model simulations by the researchers also showed that savanna systems are more resistant to [drought](#) when three conditions are met: when dense perennial grass cover is maintained, protecting the topsoil from heat-induced water loss and erosion; when the grazing pressure is adjusted to the productivity of the system; and when the [herbivore](#) community includes browsers.

More information: Katja Irob et al, Savanna resilience to droughts increases with the proportion of browsing wild herbivores and plant functional diversity, *Journal of Applied Ecology* (2023). [DOI: 10.1111/1365-2664.14351](https://doi.org/10.1111/1365-2664.14351)

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