

Diversity keeps grasslands resilient to drought, climate change

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For much of the year drought has been plaguing American grasslands. But a recent study found that grasses do not appear to be losing the turf war against climate when it comes to surviving with little precipitation.

The Kansas State University-led study looked at the [drought tolerance](#) of 426 species of grass from around the world. The goal was to better understand how [grasslands](#) in different parts of the world may respond to the changes in frequency and severity of drought in the future.

Grasslands have several important ecological functions, according to Joseph Craine, research assistant professor of biology and the study's lead author. Grasslands convert and store carbon dioxide, are a food source for [grazing animals](#) like cattle and bison, and help cool the surrounding atmosphere.

"The idea is that if you maintain a diverse grassland, you'll have a large number of drought-tolerant species ready to take over critical functions if there is a change in climate or an extended period of drought, like what we've had this year," Craine said. "Yet, we've never known which grasslands have drought-tolerant species in them."

Craine conducted the study with Kansas State University's Troy Ocheltree, research assistant of biology; Jesse Nippert, assistant professor of biology; Gene Towne, biology research associate and Konza Prairie Biological Station fire chief; and Adam Skibbe, information resource specialist for the Division of Biology, as well as with colleagues

from the University of Oregon and the Nature Conservancy in Minneapolis, Minn. It is the largest study conducted to quantify how tolerant grass species are to severe drought.

To collect data the team planted 500 species of grass taken from six continents. A majority of seeds were provided by the United States Department of Agriculture, while 52 species were collected from the Konza Prairie in the Flint Hills of Kansas. Grasses were grown on campus in a walk-in growth chamber with high intensity lighting that simulated sunny weather. After six weeks, researchers stopped watering the grass samples and observed at what point each grass stopped being able to take up water.

"In the end they all succumbed to drought," Craine said. "But that was our goal: to stress them all enough to know at what point they give in. What we saw was that some of [grass species](#) were about as tough as lettuce, meaning that after a day or two without water they would start to wilt and curl up. Others, however, were able to go for a week or two without water."

When comparing the drought resistance across the sampled species, the team found that drought-resistant grasses are well distributed across the world. As a result, grasslands are more likely to tolerate the increased periods and intensity of drought that are predicted with climate change in the future, Craine said.

"If we still have grasslands that are diverse, the grasslands are going to continue to function relatively well and not change too much," Craine said. "But when we replace our prairies with ones that just have a few species in it, then it's less likely that grasslands will be able to function normally in the future. That affects the animals and other things that depend on grasslands, making it more likely that the whole ecosystem collapses."

Additionally, researchers developed a drought index for the tested species based on the data. The index details each species' tolerance to drought and can help ecologists understand why grasslands around the world are composed of their species. More than 11,000 [species](#) of grass exist on Earth.

The benefits of a diverse grassland are evident when the U.S. faced a drought in the 1980s, said Towne, who also collects plant community data.

"After that drought we saw a booming explosion of tall grasses the following year," Towne said. "So it really backs up what the study found: that [drought](#) forces the grasslands to adapt to the weather conditions so they can get through that rough period."

More information: The study, "Global diversity of drought tolerance and grassland climate-change resilience," was recently published online at *Nature Climate Change*: www.nature.com/nclimate/journal/nclimate1634.html

Provided by Kansas State University

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