

Natural selection helps maintain plant diversity, research finds

December 15 2020, by Angela Nicoletti



Leaves from the the desert species, the hybrid and the dune species. Credit: Florida International University

It turns out where certain desert shrubs grow matters a lot—especially when it comes to making sure they don't all end up looking the same.

FIU assistant professor in the Institute of Environment Adam Roddy and a team of scientists from UC Berkeley found [natural selection](#) plays a major role in maintaining [plant diversity](#). It actually counteracts the homogenization that would normally happen when [related species](#) that can interbreed are close together.

The team studied several Encelia [species](#) native to Baja California. In this region, two subtly but drastically [different environments](#) come together when the deserts meet the [coastal dunes](#). Different Encelia species flourish here within a few feet of one another. Some grow in the dunes, others in the desert. In the transition area between the two zones lives a hybrid of the two species.

Despite the fact that these [plants](#) share genes and interbreed, they've remained [distinct species](#). These two species should have fused back into one species and come to look like the hybrids. But, they haven't.

It turns out it's a little like the story of Goldilocks and the Three Bears—the place the plant ends up has to be just right.

When the research team tried to plant seeds from one species just a few feet away in another habitat, the plant didn't survive. Desert species couldn't survive in the windier and saltier conditions of the dune. While dune species couldn't handle drought, dying in the desert.

Even the hybrid species—which share genes from the desert and dune plants—can't grow beside one of the parents. Its only home will ever be the in-between transition region.

The researchers found these results surprising because pollen and seeds, which are carried by wind and animals, can easily travel hundreds of feet away and land in different habitats. This normally gives plants a chance at interbreeding and populating new places. However, the strong natural

selection occurring in each habitat means that even though a hybrid seed can land on a dune or in the desert, it won't ever establish in the soil. It hasn't landed in the right place.

Roddy points out that understanding the evolution and biodiversity of these species is important to better understanding the plants, of course, but there's also important implications for people.

"When you look not just at these two species in Baja California, but at the entire group of *Encelia* growing throughout the deserts of the Southwest U.S. and Baja California, these plants display a remarkable diversity of novel adaptations. This dune species is salt tolerant, another species is frost tolerant, and other species are among the only species growing in the hottest and driest areas in and around Death Valley," Roddy said.

"If we better understand these adaptations to extreme temperature, salinity, and drought and how they have evolved in less than two million years—rapid in evolutionary time, then we could possibly engineer more resilient crops."

The findings were published in *Proceedings of the National Academy of Sciences*.

More information: Natural selection maintains species despite frequent hybridization in the desert shrub *Encelia*. *PNAS*, doi.org/10.1073/pnas.2001337117

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