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NEWS LIFE

Connecting our dwindling natural habitats could help preserve plant diversity

During a huge, 18-year experiment, linked areas had greater biodiversity than isolated patches

A massive ecological experiment suggests that connecting fragmented habitats with natural corridors can boost plant diversity, including butterfly milkweed (*Asclepias tuberosa*), a plant associated with longleaf pine savanna.

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By Jonathan Lambert
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An ecological experiment so big it can be seen from space suggests that connecting isolated habitats with natural corridors can help preserve plant diversity.

The 18-year-long project revealed that linking fragments of restored longleaf pine savanna by a natural passageway boosted the number of plant species by 14 percent in those patches by the end of the experiment. This increase stems from higher plant colonization rates and lower extinction rates in connected versus unconnected fragments, researchers report in the Sept. 27 *Science*.

“This study shows that corridors can, in principle, have lasting, positive effects on shrinking ecosystems,” says Jens Åström, an ecologist at the Norwegian Institute for

Nature Research in Trondheim who wasn't involved in the study. "It's rare to have ecological experiments viewable from Google Earth," he says.

Across the world, large, intact ecosystems on land are dwindling. If you parachuted into any random stretch of forest, approximately 70 percent of the time you'd land within one kilometer of a forest edge, not far from the modern world.

That fragmentation is bad for biodiversity, says Ellen Damschen, an ecologist at the University of Wisconsin–Madison. "We've known for a very long time that habitat loss and fragmentation are the primary drivers of extinction," she says. What is less clear is how best to preserve what's left.

"Preserving large areas of habitat is hugely important," Damschen says. "But it's also really difficult." If you can't have one huge forest, perhaps the next best thing is to connect fragments with natural corridors. Such connections could provide conduits for species to colonize a new area and buffer against biodiversity loss by expanding the possible range of species. Plants once isolated to a small patch of forest could, over time, move along a corridor to more fertile ground.

The specifics differ for various kinds of plants and animals, but in theory the more connected the habitat, the more resilient (*SN: 4/7/16*). But studies to back up this idea have produced mixed results, and are generally small and short-lived, Åström says. That makes it hard for ecologists to know under what circumstances corridors might actually help preserve biodiversity.

So Damschen and her colleagues devised a grand experiment. Amidst a dense pine plantation at the Savannah River Site in South Carolina, they cut 10 experimental plots of restored longleaf pine savanna into the landscape, each resembling the five side of a standard die.

At the center of each plot is a square about the size of a soccer field, surrounded by four similar plots, each about 150 meters from the center. One of those plots is connected to the center by a thin, 25-meter-wide corridor. The rest are control plots matched for area and shape, islands in a sea of dense pine. Some take the shape of a square bisected by a line, forming wings that equal the length of the corridor; others are carved as rectangles that are all equal in area but with different dimensions.

Scientists cleared experimental plots of open longleaf pine savanna in a dense pine plantation to study habitat connectivity. A central square is surrounded by four plots, one of which is connected by a natural corridor.
NEIL MCCOY, GOOGLE EARTH 2017

“This setup allowed us to test what mattered for biodiversity,” Damschen says. “Is it just area? Shape? Or do connections count?”

Over 18 years, the team watched as native longleaf pine savanna — a grassland habitat dotted with trees that once stretched from Virginia to Texas — emerged in each plot. Once a year, Damschen and two colleagues spent a few weeks documenting what plants were there.

Slowly but steadily, the connected plots pulled away from their isolated siblings in the race toward biodiversity, and began looking more like true longleaf pine savanna. Connected plots had a 5 percent higher annual colonization rate from newly introduced species and a 2 percent lower annual extinction rate, compared with the unconnected plots. Eventually, the connected plots accrued an average 24 more species than isolated plots, a 14 percent increase from 2000 to 2018.

“This may not seem like a lot, but it adds up,” Damschen says. Even more unexpected was that the rate of accrual doesn’t seem to be slowing down. “We literally predicted in our grant proposal that this would be the least likely outcome,” she says, adding that they thought that rate would level off or reverse.

The benefits of connection weren’t limited by how a plant spreads. Whether seeds travel via animals, wind or gravity, connected habitats soaked up more newly introduced species than unconnected ones.

“This study shows that corridors can work in certain systems, and that shorter-lived studies might miss the benefits,” Åström says. But nature is infinitely varied, and “what works in one system may not work in another,” he says. “This isn’t a rubber stamp for corridors as a solution for habitat loss.”

Damschen agrees, and hopes the study will be replicated in other habitats. “Our work shows that corridors shouldn't be discounted as an effective conservation tool," she says. As humans continue encroaching on the natural world and climate change alters where organisms can thrive, providing connections between natural spaces could help preserve what's left.

CITATIONS

E. Damschen et al. Ongoing accumulation of plant diversity through habitat connectivity in an 18-year experiment. *Science*. Vol 365, September 27, 2019, p. 1478. doi: 10.1126/science.aax8992.