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If We Connect Fragmented Habitat, New Species Will Come, Study Shows

An 18-year study of longleaf pine savannah showed a 5 percent species increase per year when isolated plots were reconnected

(Photo: Ellen Damschen / Editing: Neil McCoy)

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One of the major problems facing native habitats is fragmentation. As human impact creeps further and further into woods, grasslands and savannas, barriers like roads, agriculture lands and urban development are slicing and dicing natural spaces into smaller and smaller parcels. For decades, researchers have argued that connecting up these conservation areas could help improve species diversity and keep the ecosystems healthier.

Now, an 18-year-long published in the journal *Science* is one of the first long-term experiments to confirm that hypothesis, showing that relatively small habitat corridors can have big impacts on conservation parcels.

The paper is based on a highly fragmented habitat found in the American South, the longleaf pine savanna. According to a press release, 90 million acres of these ecosystems once stretched from Florida to Texas and north to Virginia. The forests

were park-like, with carpets of wildflowers stretching beneath them. Annual burns was a normal part of the ecosystem's maintenance with flames rising up the tree trunks just high enough to give lush vegetation below room to grow when the blaze went out, explains Ben Guarino at the *Washington Post*.

The forests logged and replanted with other pine species for timber plantations. Fires were snuffed to keep the forestry industry going, which caused the remaining pines to grow too closely together. This created packed forests where a foot or more of plant-smothering pine needles accrues on the forest floor, leading to a devastating loss of understory biodiversity.

Today, only about 3 percent of intact longleaf savanna remains.

For the study, the team studied longleaf pine savanna surrounding the Department of Energy's Savannah River Site, where the agency produces tritium gas for nuclear weapons. In 10 locations, the team restored 2.5-acre blocks of cleared savanna. Some were connected with 80- by 500-foot corridors of restored habitat. Other blocks were left isolated. Over the last 18 years, they've compared what's going on in the connected habitat with the isolated patches.

They discovered that annually, there was a 5 percent increase in species diversity and a 2 percent drop in the number of species going extinct. While that might not seem like much, that biodiversity builds over time. By the end of the study period, an average of 24 more plant species were growing in connected habitats than isolated savanna.

"Like compound interest in a bank, the number of species increases at a constant rate each year, resulting in a much larger bottom line over time in habitats that are connected by a corridor than those that are not," lead author Ellen Damschen of the University of Wisconsin-Madison, says in the press release.

Even after 18 years, that annual rate of species increase has not slowed. As far as conservation studies go, this one is unique for its longevity. Most research projects last just one to five years. Sharon Collinge, landscape ecologists at the University of Colorado, Boulder, not involved in the study, tells Guarino that this study confirms many assumptions about connected corridors.

"This is really the first to demonstrate this so clearly [that corridors work] for an experiment at this spatial scale and this temporal scale," she says.

The study will likely be ammunition in a controversy currently happening in conservation biology. Last year, researchers presented a paper suggesting that fragmentation didn't matter to species diversity too much; instead, they said the amount of overall habitat, fragmented or not, was what determined species survival. Nick Haddad of Michigan State University, one of the authors of the new *Science* paper, has argued against that interpretation. This latest study seems to support the idea that connectivity boosts diversity and species survival, and should be part of conservation strategy.

"We need conservation solutions that can protect existing species and restore lost habitat," he says in press release. "When I created these experimental corridors as a graduate student 25 years ago, I never imagined that the effects of corridors on biodiversity would be so strong. It was inconceivable that the full effects would take two decades or more to be fully realized. I was and am astonished."

While the study only focused on one habitat type, longleaf pine savannas, Haddad tells Guarino that he believes the results likely apply to many other habitats. "I think our results are general across systems," he says, pointing out that the study created a model for situations where "suitable native habitat is surrounded by unsuitable non-native habitat."

The finding comes at just the right time. Earlier this year, the United Nations declared the next ten years as the Decade on Ecosystem Restoration, with the goal of restoring 865 million acres of degraded land. It's hoped that the restorations will combat climate change and help boost biodiversity across the globe. Connecting fragmented habitat will be a big part of those efforts.

"It's a race against time when it comes to restoring plant biodiversity, especially in the face of accelerating climate change and landscape fragmentation," Brian van Eerden, director of The Nature Conservancy's Virginia Pinelands Program, says in the press release. "We need the best available science from long-term, large-scale studies like this to inform how to connect and manage our conserved lands to ensure the native species have the best chances to survive and thrive."

About Jason Daley

Jason Daley is a Madison, Wisconsin-based writer specializing in natural history, science, travel, and the environment. His work has appeared in *Discover*, *Popular Science*, *Outside*, *Men's Journal*, and other magazines.