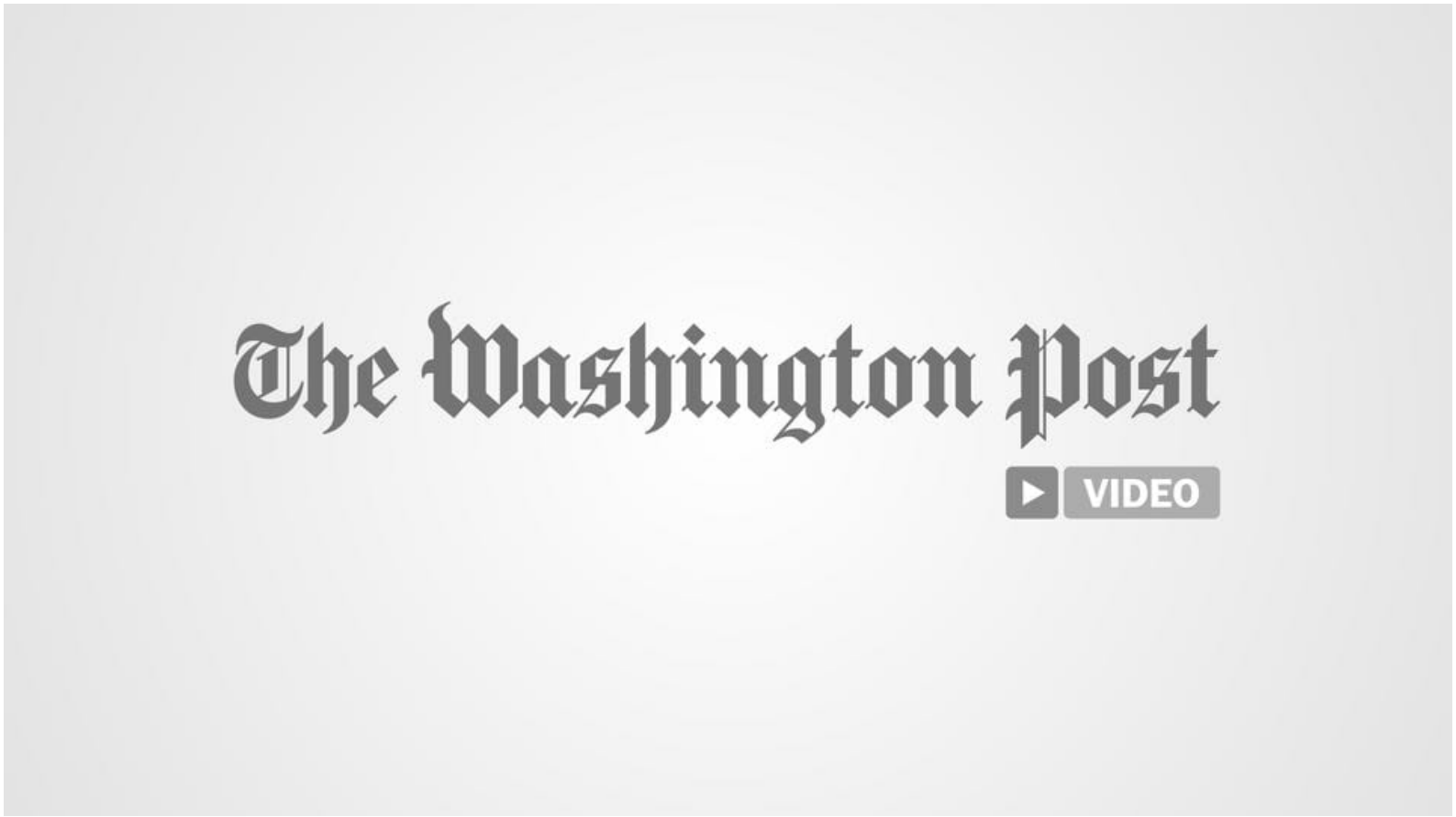
Science

Connecting fractured habitats has long-lasting ecological benefits, study finds



By Ben Guarino
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A decades-long ecological experiment in South Carolina has shown the power of a straightforward way to improve wildlife habitats: connect them. Scientists say the study's results, published Thursday in the journal Science, offer the most compelling evidence yet that connected habitats flourish for years.

Landscape corridors are strips of undeveloped or restored land that link isolated habitats. They are “the most viable path toward real conservation for biodiversity,” said Nick M. Haddad, a Michigan State University ecologist who has been studying these corridors since the 1990s. “We have the best scientific evidence that corridors work as they are intended,” he said.

Biodiversity bloomed in the experimentally linked habitats. Fewer local plants went extinct. The plant richness — the number of species — swelled each year. After 18 years, an average of 24 more plant species grew in connected habitats vs. disconnected fragments, an increase of 14 percent.

There are several efforts around the world to stitch habitat fragments together. One international re-wilding program, the Yellowstone to Yukon Conservation Initiative, has been working since 1993 to strengthen connections between wild landscapes from northern Canada to the U.S. Rocky Mountains.

Past research shows that corridors “are superhighways for plants and animals,” Haddad said. Birds zigzag through corridors with the energy of pinballs, he said, eating and defecating seeds. Butterflies and bees follow corridors and spread pollen. Seeds ride the winds that blow through corridors like gusts between tall buildings.

Until this study, most corridor experiments measured biodiversity and extinction on small scales. Andrew Gonzalez, a conservation biologist at Quebec’s McGill University who was not involved with the South Carolina experiment, observed that declines in insect populations stopped when he connected the patches of moss they lived on. The new research “adds great value to previous findings from connectivity experiments,” Gonzalez said.

Sharon Collinge, who studies landscape ecology at the University of Colorado at Boulder and was not a part of this current research, agreed. “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 said.

The study took place at the Savannah River Site, where the Department of Energy creates tritium gas for weapons in its nuclear facilities. Vast tracts of a timber plantation managed by the Forest Service surround the buildings.

Few plants grow beneath the timber trees' dense canopy. Spongy mats of pine needles, up to a foot thick, cover the forest floor. "I might see zero species in the understory," said study author Ellen Damschen, an ecosystem ecologist at the University of Wisconsin at Madison. "Maybe one or two."

Before the arrival of European settlers, longleaf pine savanna covered this land. It burned regularly, and the flames — high enough to lick trunks but rarely singeing the treetops — cleared space for perennial herbs and grasses. Trees were present but not densely packed. Dozens of different plant species grew within each square meter. Red-cockaded woodpeckers, gopher tortoises and other animals that are now rare or endangered once thrived in the savanna.

Damschen, Haddad and their colleagues studied 2.5-acre squares of restored longleaf pine savanna, as big as city blocks. In 10 cases, they constructed corridors of savanna, 500 feet long by 80 feet wide, between the plots. Viewed from above, the connected habitats have the outline of giant barbell weights.

An experimental landscape at the Savannah River Site in South Carolina used to test for the long-term effects of corridors on plant diversity. (Ellen Damschen/Neil McCoy)

Forest Service workers mimic the past by frequently setting the area on fire. The restored habitats are full of butterflies, vibrant flowers and other “fascinations of the natural world,” Haddad said, in contrast to the monotony of the pine plantation.

For 18 years, the scientists counted each plant they saw within restored habitats, totaling 200 species. “We are able to count each individual species and whether or not we see it in a given year in a given patch type,” Damschen said. Using these plant censuses, the scientists were able to determine the likelihood a given species would arrive in a patch or go extinct.

The study authors found rates of plant extinction were reduced by 2 percent annually in the connected habitats, compared with isolated patches. Newcomers took root and grew, too. The colonization of new plant species shot up by 5 percent per year.

The percent changes may seem small, “but the important point is that these rates are on an annual basis,” Damschen said, “just like your bank account, with an annual rate of interest.”

These boons to biodiversity, to the researchers’ surprise, persisted for the duration of the study. The scientists do not know when the effects will cease. They continue to study these plots.

“The longer it runs, the greater the contribution it makes to our knowledge of ecological connectivity,” Gonzalez said.

The study authors controlled for factors like area and the amount of edge surrounding a habitat, including comparisons plots attached to half-corridors that led nowhere. The 10 barbell-shape habitats were oriented in different directions and separated by large distances. Strict security measures, because of the nearby nuclear facilities, prevented any public interference. “We’re really able to say: ‘Yes, this is a consistent pattern,’ ” Damschen said.

Given the clarity and consistency of these results, Collinge said she would be comfortable applying this work to other sorts of habitats. “For plant species in forested landscapes, this is really robust,” she said.

Haddad agreed. “I think our results are general across systems,” he said, having created a model for wherever “suitable native habitat is surrounded by unsuitable nonnative habitat.”

These results, the scientists said, support policies promoting connectivity. In 2016, the governors of the six New England states and the premiers of the provinces in eastern Canada signed a resolution promoting ecological connectivity among their forests. The 2018 Farm Bill expands support for corridors — such as prairie strips — in agricultural land.

Plants and wildlife aren’t the only ones to benefit from corridors, Haddad said. Humans can, too. Buffers that run along rivers prevent pollution from entering waterways. Prairie strips prevent erosion offer habitat to native insects that pollinate crops. Urban greenways draw bikers, birders and other nature enthusiasts.

Given the long-running effects of connectivity shown in this research, Gonzalez said, the

sooner habitats are connected, the better off they can be.

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