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Human expansion will fuel more conflict with elephants without careful planning

Farmers have dealt with pests since the advent of agriculture. Cats can catch mice, and fences can keep out rabbits. But what do you do when the creature raiding your crops is a six-ton African elephant?

This is a real issue for many farmers, especially in Southern Africa. And according to a study led by UC Santa Barbara's Evan Patrick, the region will likely see more conflicts in the coming years. He and his co-authors estimate that the risk of conflicts between herds and humans could double in the region by the end of the century. But they hope that uncovering and explaining the factors fueling this issue could help governments and communities steer development away from disaster. The results appear in the Proceedings of the National Academy of Sciences, Nexus.

Uneasy neighbors

Roughly 290,000 African savanna elephants share space with a growing number of farmers in Southern Africa. Conflicts arise when elephants raid cropland, which can be financially devastating for farmers.

“Human-elephant conflict is a thorny issue in Southern Africa,” said Patrick, a postdoc in the Environmental Markets Lab (emLab) at UCSB’s Bren School of Environmental Science & Management. “Elephants’ crop raiding is linked to food insecurity and declining support for conservation initiatives in the region.”

Patrick sought to identify the factors causing conflict between humans and elephants, especially how changes in the landscape and climate could influence this in the future. He and his co-authors used statistics and machine learning models to analyze crop raiding across Namibia’s communal conservancies from 2004 to 2020. This enabled them to determine the factors that predict human-elephant conflict. They then applied these insights to identify trends across a wider area, including northern Botswana and portions of Angola and Zambia.

Closed corridors and less space

The team found that conflict between humans and elephants is shaped by the growing human population and expansion of croplands, as well as drier conditions in elephant conservation areas. Humans continue to develop ever more land at the same time as climate change reduces the elephants’ wild food supply. This dynamic naturally sends more elephants into cropland to forage, driving up both the likelihood and frequency of negative interactions.

What’s more, in most African countries, wildlife reserves are fully fenced in. “However, across much of Namibia and neighboring countries, reserves are generally unfenced, allowing for movement across wildlife corridors,” Patrick said. “This allows the region to support huge animal populations, including more than half of the world's remaining African savannah elephants.”

But the fences that do exist funnel wildlife movement into bottlenecks where conflicts between humans and wildlife are amplified. “Fences in this region often shift conflict to new areas, rather than reducing it overall,” he said. The team wants to test the role that habitat corridors could play in reducing conflict between herds and local communities. The insights could improve the design and management of the region’s wildlife corridors.

The authors also mapped the probability of conflict throughout the region, which required integrating data from two different bodies of literature: conservation planning and causal studies, which went beyond correlation to better establish cause and effect. “This helped us identify both the locations and drivers of conflict hotspots in ways neither method would do as well alone,” explained senior author Ashley Larsen, an associate professor at UCSB’s Bren School. Key variables influencing hotspots included tree cover; distance to roads, fences and rivers; human population density and the productivity of vegetation.

The spatial models predicted a general rise in the probability of crop raiding toward the end of the century under all climate change scenarios in both wet and dry seasons. Moreover, the area at risk of crop raiding doubled.

Leveraging insights to address a looming problem

Although the factors driving conflict aligned with findings from previous work, Patrick was surprised by the magnitude of change that the future may see. The Impalila Conservancy — situated on an island at the confluence of the Chobe and Zambezi rivers — provided a stark case study. Aggressive land development could cause “hundreds of additional crop raiding events per year in the future,” he said. “This level of crop raiding would severely limit the ability to farm and would raise tensions between elephants and the locals, who rely on both agriculture and tourism for their livelihoods.”

According to the authors, much of the change they saw comes from local development and land-use decisions. This means that there are pathways to reduce conflict, especially if growth is steered away from elephant reserves and movement corridors.

The research team, led by Larsen and Patrick Roehrdanz — director of climate change and biodiversity at Conservation International's Moore Center for Science — are working closely with their co-authors at the University of Namibia and the Namibian Ministry of Environment, Forestry and Tourism. The ministry oversees the country’s reserve network and coordinates with its neighbors on transboundary conservation initiatives. It currently manages a program that compensates farmers for crop damages and other human-wildlife conflict losses, and the agency is looking

for ways to anticipate and mitigate future conflict.

The insights from this study can inform proactive measures essential for long-term coexistence between humans and elephants. “We hope these findings can support community-engaged planning to reduce agricultural expansion in the most conflict-prone regions,” Patrick said. Because learning how to coexist with Earth’s largest land animal is a lot easier than chasing them out of your fields.

Emma Marris contributed to this story.

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