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Parasitic vines may serve as lightning rods

Field campaign in Panama will study whether lianas help trees to survive lightning strikes.

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Liana vines have proliferated in many rainforests including this one on Barro Colorado Island in Panama.

Tropical rainforests in Central and South America are being overrun by lianas, parasitic woody vines that clamber up trees and smother the forest canopy as they reach for sunlight. But the vines may be doing more than infiltrating the ecosystem — they may actually be protecting it.

Some researchers suspect that the vines act like lightning rods, saving trees from damage. Understanding this dynamic could help inform how the rainforests will change in the coming years, especially given the predicted effects of climate change on both lightning and lianas.

In July, a group led by Steve Yanoviak, an ecologist at the University of Louisville in Kentucky, will head to Barro Colorado Island in Panama to begin a two-year study of lianas' potentially protective role in the environment.

“Nobody has ever thought of lianas as anything but a structural parasite,” says Yanoviak. “But they might have this unforeseen secondary effect of protecting trees against strikes.”

Although lightning often sparks fires when it hits in temperate forests, tropical rainforests are usually too moist to ignite. Instead, lightning strikes are more likely to kill individual trees, leaving holes in the forest canopy, says Mark Cochrane, an ecologist at South Dakota State University in Brookings. Still, there's been very little study of the widespread effects of strikes on a tropical forest.

As temperatures increase and droughts become more frequent and prolonged, the risk of lightning-triggered fires in tropical forests could increase, says Stefan Schnitzer, an ecologist at the University of Wisconsin in Milwaukee. One climate-modelling study by NASA researchers estimates that a 4.2 °C increase in global temperature would result in 30% more global lightning[1]. Meanwhile, climate models predict more extensive drought.

Hence, if lianas do have a substantial lightning mitigation effect, their impact could be significant. In recent years, the vines have proliferated. Researchers reported that by 2007, 75% of Barro Colorado Island's trees were covered with lianas, up from 32% in

1968[2]. Lianas capitalize on forest disturbances, taking over quickly when a fallen tree leaves a gap in the canopy and climbing high into trees in dry, light-filled areas created by new roads and clear-cutting. And they grow several times faster than trees during dry weather.

Yanoviak's preliminary experiments in oak-hickory forests near Louisville indicate that vine stems have lower resistance to electricity than tree branches. The data suggest that vines such as lianas could channel the current from a lightning strike, similar to lightning rods on buildings. To test the idea, Yanoviak and his group plan to set up devices to initiate lightning strikes on trees and lianas. The remote-controlled devices are giant balloons containing 1-metre-long metal pistons. When ground-based sensors suggest a strike is imminent, the pistons can be shot up to catch the bolt. The set-up could help the group trigger lightning strikes on specific trees, or specific lianas, so that they can observe the outcome.

"It's an interesting hypothesis," says Cochrane, who is not involved in the study. "But the only way the vines would shield the tree is if their conductivity was so much higher that almost all of the current flowed through the lianas."

Yanoviak acknowledges that the small difference in electrical resistance between trees and lianas may not make a life-or-death difference during a massive electrical event like lightning. "At that scale they may not matter, but we don't know that yet," he says. "It could be that lightning is such a trivial agent of mortality that it doesn't matter, but at least we'll know."

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References

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