

Overhunting of large animals has catastrophic effects on trees

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The cherry-sized fruits of a tree species in Thailand are eaten by large animals, including bears. Credit: Trevor Caughlin

The elephant has long been an important spiritual, cultural and national symbol in Thailand. At the beginning of the 20th century, its numbers exceeded 100,000.

Today, those numbers have plunged to 2,000. Elephants, as well as other large, charismatic animals such as tigers, monkeys and civet cats, are under attack from hunters and poachers.

Overhunting of animals affects entire forest

While the loss of these animals is concerning for species conservation, now researchers at the University of Florida have shown that overhunting can have widespread effects on the forest itself.

Overhunting leads to the extinction of a dominant tree species, *Miliusa horsfieldii*, or the Miliusa beech, with likely cascading effects on other forest biota.

The scientists report their results in the current issue of the journal *Proceedings of the Royal Society B*.

Co-authors of the paper are Trevor Caughlin and Jeremy Lichstein of the University of Florida and Doug Levey, formerly of the University of Florida and now a program director in the National Science Foundation's Division of Environmental Biology.

Other co-authors are researchers at King Mongkut's University of Technology Thonburi in Thailand, Wageningen University in the Netherlands and the Royal Thai Forest Department.

Loss of one tree species has far-reaching implications



An Asian black bear photographed by a camera-trap; the overhunted bears disperse tree seeds. Credit: Dusit Ngoprasert

The ecologists show how vital large animals are to maintaining the biodiversity of tropical forests in Thailand.

The team looked at how these mammals contribute to moving seeds through the forest.

"It's not surprising that seed dispersers help trees get to new places," says Levey. "The effects of hunting can extend far beyond the hunted,

threatening the overall health of the trees that make up the forest."

Adds Caughlin, "On the surface, it doesn't seem that seed dispersal would be important for tree populations. But seed dispersal has an effect over the whole life of a tree."

Animals critical to seed transport through the forest

The scientists looked at the growth and survival of trees that sprouted from parent trees and grew up in crowded environs, compared to trees from seeds that were widely transported across the forest by animals.

The information was supplemented with a dataset from the Thai Royal Forest Department that contains more than 15 years of data on trees.

The researchers then created a long-term simulation and ran it on the University of Florida's supercomputer, the HiPerGator.



A full-grown adult Thai forest study tree; the trees are threatened by overhunting of animals. Credit: Trevor Caughlin

"Having that computing power was very important," says Caughlin, "because we had to simulate the fate of millions of seeds."

The scientists discovered that trees that grow from seeds transported by now-overhunted [animals](#) are hardier and healthier.

"Our study is the first to quantify the decades-long effects of animal [seed dispersal](#) across the entire tree life cycle, from seeds to seedlings to adult [trees](#)," says Lichstein.

Probability of tree extinction increased tenfold



Researcher surveying the tropical forest at the Huai Kha Khaeng Wildlife Sanctuary in Thailand. Credit: Trevor Caughlin

The results show that loss of animal seed-dispersers increases the probability of tree extinction by more than tenfold over a 100-year period.

"The entire ecosystem is at risk," says Caughlin.

"We hope the study will provide a boost for those trying to curb overhunting," he says, "and provide incentives to stop the wildlife trade."



Thousands of seedlings were tagged to learn how trees and seed-disperser animals interact. Credit: Trevor Caughlin

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