

# As agricultural riches waylay pollinators, an endangered tree suffers

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For the conservation of species, hostile territory might sometimes have its advantages. That's according to a study of pollen flow among trees found only in remnant patches of native Chilean forest. The data show that the pollinators those rare trees rely on can be waylaid by the abundance of resources found in agricultural lands. As a result, trees growing in native forest patches are more likely to mate successfully when separated by resource-poor pine plantations than by those more attractive farmlands.

The finding reported in the July 21st [Current Biology](#), a Cell Press publication, contradicts current wisdom that habitats hostile to an organism act as barriers to movement and attractive habitats act as corridors. The research team led by David Boshier of the University of Oxford explain the unexpected findings by what they refer to as the "Circe Principle."

"Many existing models for [pollinators](#) in fragmented landscapes assume that generalist pollinators are more likely to travel through attractive land-uses, especially those most similar to [native habitat](#)," said co-author Tonya Lander. "The Circe Principle suggests the reverse; pollinators presented with a wealth of resources, whether inside or outside traditionally defined 'habitat' are likely to move through it slowly or not leave it at all - much as Odysseus was waylaid on Circe's island, preventing his return to the waiting Penelope."

Pollinators presented with hostile or resource-poor lands may not enter at

all. But when they do, they are likely to move through as quickly as possible. Earlier models had missed this by focusing on the problem only from the perspective of the trees, not from that of the insects that pollinate them.

"The insects are generalists," Boshier said. "They visit a wide variety of plant species rather than having an obligate relationship with a single species, so they have no specific investment in finding the next tree of the same species." Their goal is simply to acquire the most resources while expending the least amount of energy, whether that's on a farm or in the forest.

The tree the researchers focused on, *Gomortega keule*, is found mainly in native [forest patches](#) within a 70 by 250 kilometer area in the Central Chile Biodiversity Hotspot and depends primarily on hoverflies for its pollination. In 1995, the Chilean government named *G. keule* a Natural Monument.

The Oxford team used paternity analysis to assign the most probable 'father' to each *G. keule* seed collected at 'mother' trees. They then used that information to model the probability of pollination between all possible pairs of trees in the study landscape. Rather than labelling land as habitat versus non-habitat as earlier models had done, the researchers divided the distance between trees into the four actual land-use types: agriculture, timber plantations, recently felled pine plantations (clearfells), and native forest.

The landscape model developed by co-author Dan Bebber showed that the probability of pollination was highest over pine plantation, moderate over low-intensity agriculture and native forest, and lowest over clearfells. They found that by changing the proportions of the four land-uses in a one kilometer distance, pollination probability could be altered by up to seven-fold.

The findings have important and practical implications for conservation."The previous lack of differentiation between non-habitat land-use types has contributed to the polarization of the conservation debate and left decision makers with the unenviable task of choosing between economic activity or the setting aside of land for conservation," Lander said.

The results suggest that support for subsistence farms and the modification of management practices to reduce the size of clearfells could have a positive influence on pollinators and pollination. More broadly, the findings support an entirely different way to view the landscape.

"Land should not be thought of simply as either habitat to be conserved or land to be used for economic purposes, rather landscapes may be viewed as a complex mosaic of land-uses, many of which may contribute to conservation and maintenance of ecosystem services if thoughtfully managed" Boshier says.

Provided by Cell Press

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