

How does landscape simplification affect plant-pollinator interaction diversity?

INTRODUCTION: The intensification of agriculture over the last 100 years has resulted in larger field sizes and loss of semi-natural habitats, creating uniform and simplified landscapes. This change has altered plant and pollinator communities, but likely also the species interactions within those communities that support pollination services (**Figure 1**). In 24 agricultural landscapes across France, Germany and Switzerland, we measured how landscape simplification affects the rate of loss of plant-pollinator *interaction diversity* compared to *species diversity*. We also examined how those pollinators species persisting in simple landscapes affected community robustness to extinctions.

KEY RESULTS:

- Interaction diversity decreased at a similar rate as plant and pollinator (bees and hoverflies) diversity with increasing landscape simplification: 20% of species or interactions were lost with an increase of arable crop cover in a landscape from 30 to 80%.
- The decrease in interaction diversity was partially buffered by abundant generalist pollinator species that were able to persist in simplified landscapes.
- The top 5% most abundant pollinator species were key in ensuring plant-pollinator network robustness. However, these species performed fewer flower visits per plant species in simplified landscapes than in complex landscapes.

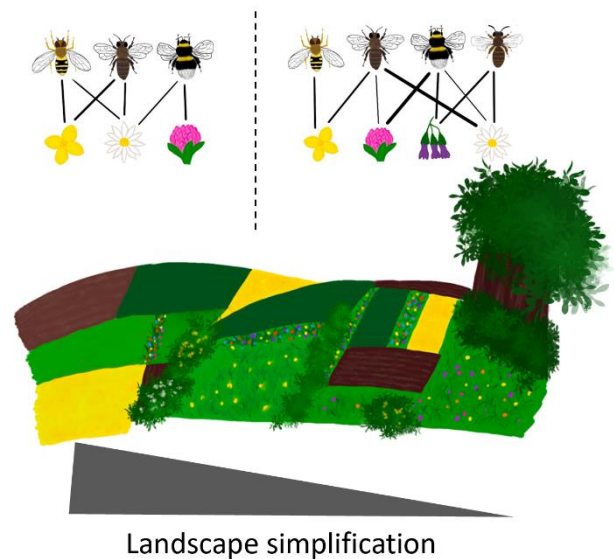


Figure 1 (Drawn by Corina Maurer with Procreate®)

CONCLUSIONS AND IMPLICATIONS:

The process of landscape simplification filters plant-pollinator species communities, with only the most abundant generalist species without specific habitat requirements able to persist. Although these generalist pollinator species maintain a level of interaction diversity and can confer network robustness in simplified landscapes, their frequency of flower visitation is reduced. Landscape simplification erodes species and interaction diversity in ways that reduce the redundancy of pollination provision. Reliance on relatively few species in simplified landscapes for pollination services is a risk if these relatively abundant pollinators should also decline.

Research article: Maurer C., Martínez-Núñez, C., Dominik C., Heuschele J., Liu, Y., Neumann P., Paxton R.J., Pellissier L., Proesmans W., Schweiger O., Szentgyörgyi H., Vanbergen A.J., Albrecht M. (2024). Landscape simplification leads to loss of plant-pollinator interaction diversity and flower visitation frequency despite buffering by abundant generalist pollinators. *Diversity and Distributions*, doi: 10.1111/DDI.13853