

# Science for Environment Policy

## Pesticides may harm wild bees but natural areas can mitigate effects

**The use of pesticides in orchards may be threatening populations of wild bees**, which are important pollinators that increase crop productivity, a new study concludes. However, the damage was mitigated in areas where the orchards were surrounded by natural landscapes, such as deciduous forests.

**Pollinators, such as bees, provide an important and often underappreciated ecosystem service** to [agricultural landscapes](#) by increasing productivity and thus profits. Traditionally, honeybees provided this service, but their populations have declined in the past 50 years for contested reasons that include [land-use](#) change, disease, and exposure to chemicals. This has resulted in shortages of available beehives to pollinate farming crops, leading to high demand and rental fees for hives in North America.

Crop management can involve a range of [pesticides](#), yet few studies have looked at how pesticides affect wild bees. Whether surrounding natural areas could mediate the harmful impacts of crop treatments on wild bees is also unknown.

The researchers surveyed bees in 2011 and 2012 at 19 apple (*Malus domestica*) orchards managed under differing pesticide regimes in central New York State, USA. The toxicity of several commonly used pesticides was assessed using a modified version of the Environmental Impact Quotient (EIQ) Field Use Rating to create a Bee Impact Quotient (BIQ) for each pesticide. Overall, approximately 25 insecticides and 25 fungicides were assessed in the study. The researchers also measured the percentage of natural area (uncultivated, minimally managed land) surrounding the orchards.

In total, they documented 1 820 honeybees and 3 800 wild bees, representing 71 species. The majority of the wild bees found were solitary, ground nesting (*Andrena*) bees, known as mining bees. Eight species of bumblebees made up 6% of the wild bees sampled.

In comparing the results of the bee surveys and the BIQ for both years, the researchers found the abundance of wild bees significantly decreased a year after application of the pesticides. The number of wild bee species also decreased marginally. Overall, these negative changes correlated with the application of fungicides before and during the apple bloom, and of insecticides following the bloom.

The study discovered that some fungicides that had a negative effect are currently labelled as non-harmful to bees.

The researchers also found the abundance of wild bees and number of species increased with the percentage of surrounding natural habitat — such as deciduous forests, wetlands, shrublands, and grasslands. These areas provide additional nesting and foraging areas for wild bees, and therefore reduce their exposure to pesticides, as well as providing diverse food sources.

The researchers highlight numerous implications of their work. They say their evidence suggests that decrease in wild bee numbers is likely a result of their exposure to farming pesticides, including some which are currently not believed to be harmful. They suggest more research into the toxicity of these pesticides, reduced use of pesticides — particularly during and around blooming when bees are foraging — and the intentional establishment of more natural or semi-natural areas around orchards. Overall, the authors say such strategies would enable protection of crops from pests while mitigating damage to wild bee communities and enhancing pollination services to farmed crops.



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