

Insect 'apocalypse' in U.S. driven by 50x increase in toxic pesticides

Bees, butterflies, and other insects are under attack by the very plants they feed on as U.S. agriculture continues to use chemicals known to kill.

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America's agricultural landscape is now 48 times more toxic to honeybees, and likely other insects, than it was 25 years ago, almost entirely due to widespread use of so-called neonicotinoid pesticides, according to a new study [published today in the journal PLOS One](#).

This enormous rise in toxicity matches the sharp declines in bees, butterflies, and other pollinators as well as birds, says co-author Kendra Klein, senior staff scientist at [Friends of the Earth US](#).

"This is the second [Silent Spring](#). Neonics are like a new DDT, except they are a thousand times more toxic to bees than DDT was," Klein says in an interview.

Using a new tool that measures toxicity to honey bees, the length of time a pesticide remains toxic, and the amount used in a year, Klein and researchers from three other institutions determined that the new generation of pesticides has made agriculture far more toxic to insects. Honey bees are used as a proxy for all insects. The U.S. Environmental Protection Agency does the same thing when requiring toxicity data for pesticide registration purposes, she explained.

The study found that neonics accounted for 92 percent of this increased toxicity. [Neonics are not only incredibly toxic to honeybees](#), they can remain

toxic for more than 1,000 days in the environment, said Klein.

"The good news is that we don't need neonics," she says. "We have four decades of research and evidence that agroecological farming methods can grow our food without decimating pollinators."

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"It's stunning. This study reveals the buildup of toxic neonics in the environment, which can explain why insect populations have declined," says Steve Holmer of [American Bird Conservancy](#).

As insects have declined, the numbers of [insect-eating birds](#) have plummeted in recent decades. There's also been a widespread decline in nearly all bird species, Holmer said. "Every bird needs to eat insects at some point in their life cycle."

What are neonics?

Neonic insecticides, also known as neonicotinoids, are used on over [140 different agricultural crops](#) in more than 120 countries. They attack the central nervous system of insects, causing overstimulation of their nerve cells, paralysis and death.

They are systemic insecticides, which means plants absorb them and

incorporate the toxin into all of their tissues: stems, leaves, pollen, nectar, sap. It also means neonics are in the plant 24/7, from seed to harvest, including dead leaves. Nearly all of neonic use in the U.S. is for coating seeds, including almost all corn and oilseed rape seed, the majority of soy and cotton seeds, and many yard plants from garden centers.

However only 5 percent of the toxin ends up the corn or soy plant; the rest ends up the soil and the environment. Neonics readily dissolve in water, meaning what's used on the farm won't stay on the farm. They've contaminated streams, ponds, and wetlands, [studies have found](#).

This is the first study to quantify how toxic agricultural lands have become for insects and it shows toxicity levels rapidly increased when treating seeds with neonics really took off, said Klein. "This is also when beekeepers began to see declines in bee numbers," she says.

These are correlations, since the study did not quantify or estimate what bees or other insects are actually exposed to. It may or may not overestimate actual insecticide doses received by bees, the study says.

However, the study did not look at the many documented nonlethal impacts of neonics on bees, including impaired reproduction, altered immune function, and inability to navigate effectively.

"For that reason we think our study is a very conservative estimate," Klein says.

Insect apocalypse?

Some scientists have been warning that there is an "[insect apocalypse](#)" underway. A [global analysis of 452 species](#) in 2014 estimated that insect abundance had declined 45 percent over 40 years. In the U.S. the numbers of

iconic Monarch butterflies has fallen [80 to 90 percent](#) in the last 20 years. A study published last month reported that [81 species of butterflies in Ohio](#) declined by an average of 33 percent in the last 20 years. Systematic measurements of butterfly populations are the best indicator of how the world's 5.5 million insect species are doing, the authors of the Ohio study noted.

Not only do bees, butterflies, and other insects pollinate one-third of all food crops, declining insect numbers can also have catastrophic ecological repercussions. Renowned Harvard entomologist E.O. Wilson has said that without insects the rest of life, including humanity, "[would mostly disappear from the land. And within a few months.](#)"

In April 2019 a major study warned that [40 percent of all insect species face extinction](#) due to pesticides—particularly neonics, since they're the most widely used insecticide on the planet—but also because of with climate change and habitat destruction.

The study authors acknowledge that "their analysis is simplistic and not a suitable basis upon which to draw conclusions about risk," says David Fischer, Chief Scientist and Director, Pollinator Safety, at Bayer Crop Science.

Regulatory agencies such as the EPA have concluded that seed treatment with neonics poses a low risk, Fischer wrote in an email.

Bayer-Monsanto makes imidacloprid and clothianidin, two of the three neonicotinoids that contributed most to overall toxicity, according to the PLOS One study. Syngenta-ChemChina makes the third one, thiamethoxam.

"Neonics are less toxic to non-target organisms than older insecticides, and, when used according to the label, are low risk to bees," says Syngenta in a statement.

In 2018, the [European Union banned](#) neonicotinoids for field use based on their harm to pollinators. In 2019, Canada also [passed restrictions](#) on the use of the most widely used neonicotinoids.

Farms using neonics had 10 times the insect pressure and half the profits compared to those who use regenerative farming methods instead of insecticides [according a 2018 study](#). Like agroecological farming, regenerative agricultural uses cover crops, no-till and other methods to increase on-farm biodiversity and soil health. The regenerative corn-soy operations in the study didn't have to worry about insect problems, said co-author Jonathan Lundgren, an agroecologist and Director of the [ECDYSIS Foundation](#).

Farmers who are dependent on chemicals are going out of business, said Lundgren, who is also a grain farmer in South Dakota. "It's painful to see when we have tested, scientifically sound solutions. Working with nature is a good business decision," he says.