

Saving our bees: Ecologists assess the impact of people on pollinators

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Most of the world's plant species rely on animals to transfer their pollen to other plants. The undisputed queen of these animal pollinators is the bee, made up of about 30,000 species worldwide, whose daily flights aid in the reproduction of more than half of the world's flowering plants. In recent years, however, an unprecedented and unexplained decline in bee populations across the U.S. and Europe has placed the health of ecosystems and the sustainability of crops in peril.

In an oral session at the Annual Meeting of the Ecological Society of America, an interdisciplinary group of scientists will explore the problem of bee habitat loss at a broad scale to determine what can be done to preserve bees in their native habitats. The session, titled "The Landscape-Scale Ecology of Pollinators and Pollination," will include scientists in the fields of computer science, mathematics and ecology from institutions in the U.S., Europe and Asia.

The most recent and headline-capturing phenomenon, known as colony collapse disorder, is characterized by the disappearance of adult honeybees from beekeeper hives, leaving behind bee larvae with no caretakers. The bee decline is particularly unnerving for farmers because an estimated 80 percent of all food crops are pollinated by honeybees and their wild cousins. Stymied scientists have proposed a host of reasons for managed honeybee declines, including climate change, parasites, diseases, overexposure to pesticides and loss of suitable habitat; most researchers believe that a combination of these factors is responsible. In this oral session, scientists turn their attention to native,

wild bees to determine whether they are undergoing – or might undergo – the same decline.

One of the session's organizers, Neal Williams of Bryn Mawr College, hopes that the session will result in the synthesis of ideas from many disciplines. "We want to know: Can we look at landscape models in a predictive way and use those to inform us about natural populations and how they deliver pollinator services to crops?" he asks.

Rachael Winfree of Rutgers University is particularly interested in the health of native bees as "biological insurance" against the decline of honeybees. "Over half of the world's native plants require animal pollinators, and most of those are bees," she says. "Native pollinators are serving as a backup plan for the honeybee."

Winfree will present a study that combines data from over 50 published studies of bee population sizes and diversity. She found that in areas of extreme fragmentation due to human development, animal grazing, logging and crop fields, bee populations were smaller and the number of bee species was lower than in natural or minimally disturbed areas.

Scientists are also using technological methods to further understand bee communities. Daniel Chalk, a graduate student at the University of Exeter in the United Kingdom, used an artificial intelligence computer model to predict flight patterns of wild bumblebees. His model is useful because it can predict how bees would forage, or look for food resources, in different landscapes.

"Crucially, our model is able to predict the behavior of bees in larger-scale foraging environments, where the foraging patches can be thought of as large fields of crops," says Chalk. His model, he says, could help scientists understand how land disturbance caused by humans affects bee species richness and density.

Williams used an experimental approach to understand the landscape-scale ecology of native bumblebees. He and his colleagues established 38 bee colonies across central California, ranging from undisturbed chaparral to organic and conventional farms. During the course of the summer months, they found that the further a colony was from natural areas, the fewer worker bees it sustained. Williams' team also found that bees always collected pollen from both crops and native plants. Since crop fields aren't in bloom for the entire bee active season, Williams says, the bees need an adequate alternative source of nectar and pollen, and may travel several kilometers to find it. Therefore, a mosaic landscape that has natural areas mixed in with agriculture is important to keep bee colonies healthy.

"Today's landscape is both natural and managed," says Williams. "It's not just matrix of natural areas with agriculture mixed in, but a patchwork quilt with animals using all of the areas in the landscape."

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