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Our Bees, Ourselves

Bees and Colony Collapse

By MARK WINSTON JULY 14, 2014

VANCOUVER, British Columbia — AROUND the world, honeybee colonies are dying in huge numbers: About one-third of hives collapse each year, a pattern going back a decade. For bees and the plants they pollinate — as well as for beekeepers, farmers, honey lovers and everyone else who appreciates this marvelous social insect — this is a catastrophe.

But in the midst of crisis can come learning. Honeybee collapse has much to teach us about how humans can avoid a similar fate, brought on by the increasingly severe environmental perturbations that challenge modern society.

Honeybee collapse has been particularly vexing because there is no one cause, but rather a thousand little cuts. The main elements include the compounding impact of pesticides applied to fields, as well as pesticides applied directly into hives to control mites; fungal, bacterial and viral pests and diseases; nutritional deficiencies caused by vast acreages of single-crop fields that lack diverse flowering plants; and, in the United States, commercial beekeeping itself, which disrupts colonies by moving most bees around the country multiple times each year to pollinate crops.

The real issue, though, is not the volume of problems, but the interactions among them. Here we find a core lesson from the bees that we ignore at our peril: the concept of synergy, where one plus one equals three, or four, or more. A typical honeybee colony contains residue from

more than 120 pesticides. Alone, each represents a benign dose. But together they form a toxic soup of chemicals whose interplay can substantially reduce the effectiveness of bees' immune systems, making them more susceptible to diseases.

These findings provide the most sophisticated data set available for any species about synergies among pesticides, and between pesticides and disease. The only human equivalent is research into pharmaceutical interactions, with many prescription drugs showing harmful or fatal side effects when used together, particularly in patients who already are disease-compromised. Pesticides have medical impacts as potent as pharmaceuticals do, yet we know virtually nothing about their synergistic impacts on our health, or their interplay with human diseases.

Observing the tumultuous demise of honeybees should alert us that our own well-being might be similarly threatened. The honeybee is a remarkably resilient species that has thrived for 40 million years, and the widespread collapse of so many colonies presents a clear message: We must demand that our regulatory authorities require studies on how exposure to low dosages of combined chemicals may affect human health before approving compounds.

Bees also provide some clues to how we may build a more collaborative relationship with the services that ecosystems can provide. Beyond honeybees, there are thousands of wild bee species that could offer some of the pollination service needed for agriculture. Yet feral bees — that is, bees not kept by beekeepers — also are threatened by factors similar to those afflicting honeybees: heavy pesticide use, destruction of nesting sites by overly intensive agriculture and a lack of diverse nectar and pollen sources thanks to highly effective weed killers, which decimate the unmanaged plants that bees depend on for nutrition.

Recently, my laboratory at Simon Fraser University conducted a study on farms that produce canola oil that illustrated the profound value of wild bees. We discovered that crop yields, and thus profits, are maximized if considerable acreages of cropland are left uncultivated to support wild

pollinators.

A variety of wild plants means a healthier, more diverse bee population, which will then move to the planted fields next door in larger and more active numbers. Indeed, farmers who planted their entire field would earn about $27,000 in profit per farm, whereas those who left a third unplanted for bees to nest and forage in would earn $65,000 on a farm of similar size.

Such logic goes against conventional wisdom that fields and bees alike can be uniformly micromanaged. The current challenges faced by managed honeybees and wild bees remind us that we can manage too much. Excessive cultivation, chemical use and habitat destruction eventually destroy the very organisms that could be our partners.

And this insight goes beyond mere agricultural economics. There is a lesson in the decline of bees about how to respond to the most fundamental challenges facing contemporary human societies. We can best meet our own needs if we maintain a balance with nature — a balance that is as important to our health and prosperity as it is to the bees.

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