



# Science Sweetens Outlook for Honey Bees, Biodiversity

Pollinators - such as bees, butterflies and bats - are responsible for the continued existence of more than seventy percent of the world's flowering plant population. By carrying pollen from the male to female parts of flowers, pollinators assist in plant reproduction and thus biodiversity.

The pollination efforts of honey bees are estimated to contribute in excess of \$2.2 billion to Canada's agricultural economy, each year. From the production of hybrid canola seed in Southern Alberta to the pollination of blueberries in the Maritimes and British Columbia, honey bees are the primary managed pollinator for Canada's agricultural food production.

*Native bees nest in a wide variety of habitats including soil, wood and cavities and, depending on the species, can pollinate a wide variety of flowers or, in some cases, form an intricate relationship with a single plant species. Unlike honey bees, whose hives can be moved closer to food supplies, native bees must make a living on the resources offered by their local environment. If the land is altered, and their food supply and home are disturbed, they'll either leave or cease to exist.*

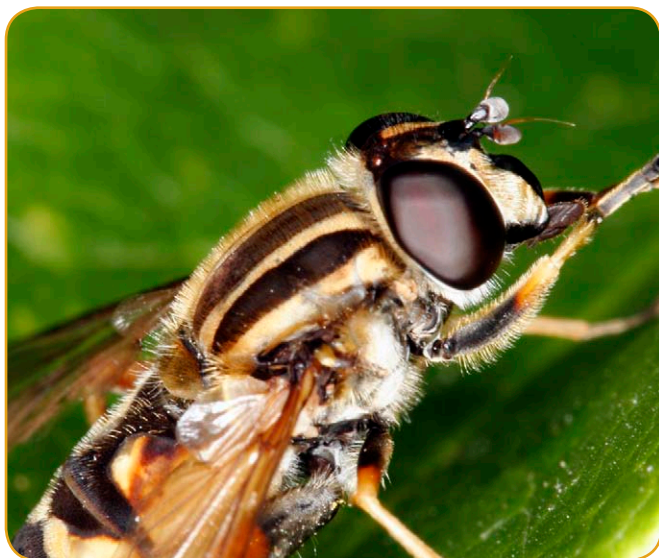
Unfortunately habitat destruction and alteration, pesticide use, and pathogen spill-over is contributing to a decrease in the abundance and diversity of wild and managed pollinators, such as honey bees. In 2009, the Canadian Association of Professional Apiculturists reported three

consecutive years of wintering losses hovering at thirty per cent, twice the normal rate.

To address emerging bee health issues and help honey producers cope with these challenges, Agriculture and Agri-Food Canada (AAFC) researchers are working closely with the Canadian Honey Council, the Canadian Association of Professional Apiculturists and their international counterparts.

AAFC's national apiculture research scientist in Beaverlodge, Alberta specializes in the management and detection of honey bee diseases and the prevention of chemical residues in honey. One research project is examining and developing treatment strategies for *Nosema ceranae*, a newly-introduced parasite implicated in the recent losses of colonies world-wide. Here researchers are developing safe and easy methods for beekeepers to disinfect their equipment of the disease, determining how to best target the application of treatments and establishing how the disease impacts colonies under Canadian conditions.

Research in Beaverlodge has also led to innovative solutions to enhance bee health. One project is examining a marker-assisted selection technique for improved breeding of bees resistant to American foulbrood disease and parasitic *Varroa* mites. With collaborators from the University of British Columbia,



high-throughput proteomic techniques are being used to identify putative markers for improving the specificity and speed by which resistance breeding can take place.

Scientific input from AAFC scientists in Beaverlodge and other partners also recently helped the Canadian Honey Council produce a handbook for beekeepers, outlining the most up-to-date techniques for monitoring and treating colonies for known diseases and pests during critical spring and fall management periods.

Though the honey bee, *Apis mellifera*, is vital to modern agricultural production, we should not overlook that over 700 native species of bees also exist in Canada. These species have a unique role in the maintenance of the country's biodiversity. They are essential to the reproductive cycles of most flowering plants and thus to the ecosystem itself, by supporting plant populations that other animals and birds rely on for food and shelter. If the proper environments don't exist for these bees, they cannot survive to continue pollinating the plants they are uniquely responsible for.

In one sense, bees are very much the same as us; their "neighbourhood" must include a suitable place to live from which they can access food and other requirements over the course of their life span. The loss of this "real estate" and the loss of local biodiversity via mass growing of a single crop limit areas where diverse bee communities can survive. The loss or reduction of bees and their pollination services sends ripples throughout the entire ecosystem that impact the very sustainability and resilience of the landscape.

Thankfully, researchers in Kentville, Nova Scotia are looking at the impact of changing landscape patterns on native bee communities. The goal is to develop conservation and restoration guidelines for the landscape to nurture the preservation of native bee populations in Canada. They are formulating realistic management programs for the landscapes that bees and other pollinators live in.

For example, one project is investigating the relationship between the amount and distribution of feeding and nesting habitats and the abundance and diversity of native bees available for pollination in lowbush blueberry agro-ecosystems. In other words; "*How much habitat is required to maintain healthy native bee populations?*" Working closely with members of the blueberry industry, these findings are being used to inform land development decisions so that critical native bee habitat, and by extension pollination service, is maintained as part of the agricultural landscape.

This research concept can also be applied in many other settings to maintain pollinator and plant biodiversity. For example, city planners can integrate green spaces into their layouts, and farmers can enhance or maintain "bee friendly" habitat on their land to promote diverse native bee communities. Incorporating native flowers and plants into a family garden not only looks nice, but can offer nesting opportunities and a source of nectar and pollen for these insects.



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