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A bombus Mixus, or bumblebee, seen gathering pollen from a black raspberry bloom.

Photo courtesy Xerces Society.

// RESEARCH & TECHNOLOGY //

Crop Pollinating Native Bees: Insects Working On The Farm

By Mace Vaughan

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Farmers need insect pollinators to produce many different types of marketable fruits and vegetables. These include apples, almonds, berries, cherries, cucumber, melons, squash, sunflower and watermelon, to name just a few. In fact, worldwide, animal pollinators are required for over 70 percent of crop species. In the United States, this produce represents about 30 percent of the foods and beverages we consume. Even self-pollinating crops such as tomatoes, peppers and eggplants, often produce more, larger or higher-quality fruit when cross-pollinated by insects.

Today, the European honey bee usually gets credit for providing this service; however, recent research is demonstrating that our native bees also are important pollinators, responsible for an estimated \$3 billion in produce each year in the U.S.

Honey bees form the cornerstone of agricultural pollination in the U.S. and will continue to do so for many years to come. Due to declines in the bee keeping industry however, honey bee colonies can be in short supply or expensive when most needed. For example, during California's almond bloom this year, growers rented honey bee hives for up to \$150 a piece, almost three times the average price of just two years ago. Various problems (for example diseases, parasites, Africanized bees, and now Colony Collapse Disorder) are likely to further discourage bee keeping and this rising trend in price is likely to continue.

Native bees may be able to take some of the burden off honey bees, if not replace honey bees altogether. Wild-living native bees already occur on most farms, contribute to current crop yields, and can provide an insurance policy for farmers' pollination needs. Their value is clearly illustrated by Claire Kremen, University of California, Berkeley, and her research team in California's Central Valley, who have found over 50 species of native, unmanaged bees providing pollination services to 14 different crops. In fact, when there is enough habitat on or near a farm, native bees provided all of the pollination needed by certain crops, even those with heavy pollination demands such as watermelon. On the East coast, 45 different species of native bee have been documented to pollinate berry crops. There is similar potential across the country.

In addition, native bees have recently been demonstrated to do some things that honey bees cannot accomplish. For example, native bees can significantly increase tomato production. It is well known that tomatoes receive enough self-pollination just by wind to produce satisfactory yields. It also is known that tomato flowers do not attract honey bees because no nectar is produced and the pollen is hidden deep inside pores in the anthers. Many native bees, however, are able to vibrate the tomato anthers in just the right way to dislodge this pollen. In so doing, they significantly increase cross pollination between plants. The result is that fruit set can go up by almost 50 percent and fruit weight is nearly doubled when these flowers are visited by native bees compared to wind alone.

In another example, Sarah Greenleaf, University of California, Davis, demonstrated that native bees cause honey bees to move more often between male and female rows of sunflowers in hybrid seed operations. The result is an increase in cross-pollination and a doubling of sunflower seed yields.

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Establishing a healthy population of native bees on your land

The abundance of native bees depends upon both suitable habitat near a field and careful farm management. Farms close to natural or wild habitat already may be visited by significant populations of native bees. If growers want to increase populations of these wild bees on their land, three resources must be in place: nesting sites, a variety of flowering plants that provide pollen and nectar and a refuge from insecticides. All of these resources can occur in small patches or in marginal areas across a farm, such as around farm ponds, fence-rows or field margins.

Ensuring adequate nest sites is an easy thing to do. Be on the look out, and try to protect native bee nests already established on your property. Ground nesting bees (these are different from yellow jacket wasps) often occur in well-drained, bare, sandy loam soils that are not tilled year-after-year. Tunnel-nesting bees use holes in old snags or the center of pithy twigs. You can also make artificial nest sites for native bees by boring holes in lumber or creating small patches of bare soil with sparse vegetation.

Providing forage areas may be as simple as leaving weedy borders or allowing cover crops to bloom. Growing a diverse array of crops, rather than a single crop, and planting patches of native flowers also helps to attract valuable pollinators. Ideally, a farm should always have something in bloom, from early in the spring until the fall. These flowers can include the crops themselves or adjacent plants. Perhaps ideally for crop production, forage patches should include flowers that bloom before and after the crop for which you most need pollination. Many of our native bees are active as adults for only about five weeks, longer than the typical bloom period for the varieties of crops in the field. Because of this, the bees on a piece of land will only reproduce successfully and be there when your crop requires them, if they can find flowers before and after a crop is in bloom.

Finally, if pesticides—even those approved for organic operations—are used, growers can reduce their impacts on pollinators in simple ways. For example, apply pesticides just after dark when bees are no longer visiting the field (pest insects often remain on the crop during the night) and never apply insecticides to plants in bloom, even weeds that grow around field margins. Switch to pesticides that are less toxic to bees and adopt appropriate integrated pest management practices for selected crops.

A more productive and sustainable future

We all desire the most efficient, cost-effective and reliable pollination strategy. Our native bees can be an important part of this strategy and, with a small effort on the part of growers, may improve the reliability and effectiveness of pollination for a variety of crops. Farmers can provide a haven for native bees that will result in greater crop yields and lower costs for renting pollinators, and will provide an insurance policy when honey bees are scarce. These same habitat enhancements can also support other beneficial insects, shade irrigation ditches and streams, conserve water and reduce erosion, buffer winds and beautify your farm. By “growing” these wild bees in addition to your crops, you will support sustainable agriculture and help native bee populations, as well as the native and crop plants they service.

For more information

The Xerces Society for Invertebrate Conservation publishes *Farming for Bees: Guidelines for Providing Native Bee Habitat on Farms*. This and other materials are available at our website www.xerces.org (follow the links to “pollinator conservation”). Xerces also produces *The Pollinator Conservation Handbook*.

The Xerces Society provides workshops to growers or agricultural professionals and in promoting demonstration sites for growers to learn from each other. For more information, please contact Mace Vaughan at (503) 232-6639, or mace@xerces.org.



A *bombus vosnesenskii* is a type of bee found on the Pacific coast of the United States, where fruit and vegetable production requires a large population of pollinating insects.

Photo courtesy Xerces Society.

About the Writer: Mace Vaughan is the conservation director, entomologist/educator at the Xerces Society for Invertebrate Conservation. Since 1971 the Xerces Society has been protecting wildlife through invertebrate conservation.

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