

# OREGON'S

AGRICULTURAL PROGRESS

Fall 2007



**As honey bees decline, researchers examine the role of native pollinators.**

**by Carol Savonen**

It's a warm August day, and I am traveling with OSU entomologist Sujaya Rao on country roads west of Salem, through a hilly mosaic of Christmas tree farms, vineyards, and hayfields. We pull over at a field carpeted with purple blooms of red clover.

The air vibrates. Circling over the field are hundreds of fat, fuzzy bumble bees. Looking like Goodyear blimps of the insect world, the large native bees fly from flower to flower. The pollen sacs on their hind legs grow heavier by the minute. It takes some work to spot the smaller honey bees in the crowd, despite the fact that there are several tiers of rented honey bee hive boxes stacked in the field.

"With all those commercial honey bee hives sitting out there, don't you think you'd see more honey bees out here?" asks Rao. "We are learning that it is not necessarily true."

This red clover field is planted for its seed. Oregon is the world's largest producer of red clover seed and a major producer of several other clover varieties that are planted around the globe as animal forage and soil-enriching cover crops. Western Oregon's climate is perfect for producing premium clover seed, which can be grown with minimal irrigation and then dried in the field.

Good pollination is key to excellent clover seed production. Both domestic honey bees and native bumble bees gather pollen out of the dense heads of clover flowers, each flower head made up of as many as 200 tiny tubular blossoms. Each tubular blossom, when pollinated, produces one red clover seed. The more blossoms visited, the more seed set. Rao and William Stephen, a bee expert and OSU professor emeritus of entomology, have a grant from the grower-funded Oregon Clover Commission to investigate the relative roles that honey bees and native bees play in pollinating clover seed crops. They want to know what kind of flowers each kind of bee visits and how far each will travel to get pollen and nectar.

Honey bees are the workhorses of most agricultural pollination. Docile enough to be handled, European honey bees were domesticated thousands of years ago and later brought to the New World. Extremely sensitive to their environment, honey bee populations have declined significantly over the past few decades. Like modern livestock, most honey bees are consigned to living in crowded quarters where, without careful management, they are prone to diseases and parasites that knock them back periodically.

The latest honey bee crisis, known as “colony collapse disorder,” has been front-page news during the past year. In some regions of the country, but not Oregon, many of the honey bees and their wild colonies have disappeared. Though no single cause has been pinpointed, a recent study in *Science* has identified a possible factor, a virus. Honey bee populations in the Pacific Northwest are not seriously affected by the disorder at this time, according to Michael Burgett, an OSU professor emeritus of entomology. But Oregon biologists, conservationists, and growers are increasingly concerned about the overall decline of pollinators, and they are looking at native pollinators as a kind of ecological insurance policy for pollination of crops and native plants.

“A lot of attention has been spent on honey bee pollination,” says Rao, who is an associate professor in OSU’s Department of Crop and Soil Science. “But we don’t really know how much pollen is transferred by other types of pollinating insects such as bumble bees and leaf cutting bees.”

Native pollinators fly under most people’s radar. But bumble bees, carpenter bees, and sweat bees are among the 4,000 kinds of bees native to North America. A study published in the April 2006 issue of the journal *Bioscience* reported that native insects pollinate \$3 billion per year in crops in the United States.

Sometimes called the “forgotten pollinators,” native bees have life cycles quite different from domesticated honey bees, explained Stephen. Native bees do not live together in huge colonies as honey bees do. They don’t have to make vast quantities of honey, because they live for only one season. They live alone or in small groups in holes or natural cavities. Honey bees are long-lived generalists, able to pollinate many kinds of plants; native bees are often specialized and focus on a few kinds of plants during their short lifetimes.

Rao walks out into the red clover field and deftly traps individual bees for examination, each in its own tiny bottle. Their hind legs are laden with oblong pollen sacs, some dusty yellow or saffron orange; others are shiny and brown and look like earwax.

Each kind of flower has pollen of a slightly different color,” explains Rao. “I record the time and place I collect each bee, then later, under a microscope, I determine what kinds of pollen each kind of bee collects at particular times of day. That way, we can see if the honey bees are truly loyal to the crop they were ‘hired’ to pollinate.”

Driving over a ridge, we visit another field. This one is covered in white and purple heads of arrowleaf clover, another commercial seed crop. We pull up to a glass jar topped with a blue plastic-finned lid hanging from a pole. The jar is full of bees. “Just look at all these native bees,” Rao exclaims. “I just put this out this morning. There must be more than 100 in here. This blue color is irresistible to them.”

The jar is warm and vibrating in my hand; I see no honey bees inside. But like a fatal attraction, bumble bees, sweat bees, and orchard bees flock to Rao’s blue traps, allowing her to see which species are there at any given time through the bloom season. This affinity for a single hue prompted Rao and Stephen to see whether the color blue can be used to attract additional native pollinators to a flowering field.

A long clothesline festooned with blue plastic flags hangs along the edge of another of the clover seed fields. Rao paces slowly away from the line, with pen and paper in hand. For two minutes, she tallies every bee she sees—both honey bees and bumble bees—at different distances from the blue line.

At another stop, we visit a series of room-size mesh-covered cages along the edge of a blooming red clover field. In each cage, Rao and Stephen have put only one kind of bee—honey bees or bumble bees or smaller, shiny leaf cutting bees. “Control” cages have no bees in them at all. When the bloom is

finished, they will measure the seed yield in each cage and compare the productivity of each pollinating species.

Other people are paying increased attention to native pollinators as well. "We are concerned that overreliance on honey bees as crop pollinators is putting all of our eggs in one basket," said Joe Williams from U.S. Department of Agriculture's Natural Resources Conservation Service in Corvallis. Williams and the nonprofit Xerces Society are trying to determine which plants are most attractive to native pollinators through the seasons, so they can recommend plants for growers to sow near their fields. They are encouraging landowners to plant native flowering plants near crop fields to provide a place for native bees to nest and give growers a back-up for pollination.

What's good for native bees is good for commercial beekeepers and their honey bees, said Corvallis beekeeper and OSU-trained ecologist Karen Finley. "Any time a grower is attentive to native pollinators, honey bees will benefit as well," said Finley. Honey bees use native plants and wild habitat too, especially after crops have finished blooming. And native bees add to the insurance that both crops and wild plants will be pollinated and set fruit.

## THE MYSTERY OF THE COLOR BLUE

A few years ago, OSU entomologist Sujaya Rao (below) made an important discovery.

"I had set out jars designed to trap Asian lady beetles," recalled Rao. "I set out jar traps with lids of all colors—red, yellow, green, blue. When I came back the next day to collect my beetles, I noticed that the jars with the blue lids had bumble bees in them—sometimes hundreds of bumble bees, as well as other native bees. I was in a fallow barley field, with no flowers to attract any bees. I was expecting beetles, but there were the bees."

Rao contacted Bill Stephen, a retired OSU entomologist and a world expert on native and solitary bees. They began conducting experiments, using different colored jar lids, in different parts of the state. In every region, the native bees always preferred blue over any other color.

"We soon realized that the blue lid has magic in it," said Stephen. "No other bee of any kind is known to be attracted to something purely on the basis of color."

Discovering the mystery of the color blue was a scientific gold mine. "We had no reliable method for taking a census of native pollinators," Stephen recalled. "Until now."

The entomologists are experimenting with blue flags arrayed across a crop field (right) to see whether growers can use them to attract native bees into their fields.

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