Bee Heroes Teacher Background Reading

Un-bee-lievable Diversity!

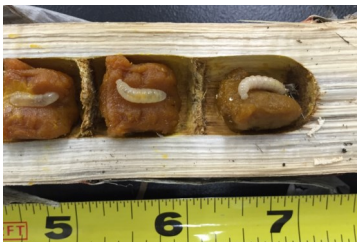
Welcome to the bee capital of the United States! There are some 20,000 species of bees worldwide, with approximately 4,000 different kinds in the U.S. and 1,300 in Arizona. The Sonoran Desert region has some of the greatest diversity of bees anywhere with at least 1,000 different species.

Most of us are familiar with honey bees, which came to North America with Europeans in the 1600s. Some escaped domestication, and feral colonies exist all over the Americas today. However, a diverse array of native bees have lived here far longer, adapting to regional ecological conditions. They range from the tiny, rusty Fairy Bee (*Perdita minima*), at <.08 inches/2 mm, to the large, shiny, black Carpenter Bee (*Xylocopa sp.*) at ~1 inch/25 mm in length. Like honey bees, they collect flower nectar and pollen to eat and to feed their young, but do not use them to create stores of honey.

Fairy Bee superimposed on the head of a Carpenter Bee.
Credit: Stephen Buchmann

Native Bees – "Jacquelines" of All Trades

Unlike the highly social honey bees whose labors support the entire colony, most native bees (>75%) are solitary. Each female bee is a hard-working solitary mom who needs food and shelter for her brood. She mates, selects a site for a nest, and constructs brood cells. Over countless forays, she gathers pollen, nectar, and occasionally floral oils, until she amasses enough to provision a youngster to adulthood. She kneads them together, along with her anti-microbial saliva, into a ball of bee bread, then lays a single egg on top. She seals the brood cell shut, repeating the process for additional young. Inside, the larvae grow, pupate, and metamorphose into adults, then emerge to continue the cycle.



Carpenter Bee larvae on bee bread in brood cells within a yucca stalk.
Credit: Stephen Buchmann

The majority of solitary bees are short-lived, just a few weeks to a month, and have one generation per year. Adults emerge from their natal cells when flowers bloom in spring and summer and mate soon after. The male bees' primary purpose is reproduction. They do not build nests but visit flowers for energy, and in the process contribute to pollination.

Home Sweet Home

Most solitary bee females (70%) nest in holes they dig in the ground, often in large aggregations of many thousands of individual bees. Others nest in holes in rocks, in hollow stems, or in tunnels in wood made by other insects or chewed with their own powerful mandibles. They do not cooperate with each other to build or provision their nests and are not aggressive. Although most females have stingers, they rarely sting unless threatened.

Cactus Bee in ground nest hole.
Credit: Joseph Wilson

On the Social Side

Some native bees exhibit social behaviors. Carpenter bee (*Xylocopa sonorina*) females are long-lived "cooperative breeders." They share their nest with first-year young. Males disperse, but mothers and daughters live together in the nest for 2-3 years and have a division of labor. Mothers forage and do most of the reproduction, while daughters are non-reproductive guards and foragers. The mothers will eventually die, and their daughters remain in the nest.

Sweat bees (*Augochlorella* sp.) can be “primitively social” – they overwinter as fertilized females, emerge, provision a nest and lay mostly female eggs. The adult daughters take over provisioning while the foundress remains as queen. She may lay up to three generations of eggs before dying. Females of the final brood mate and start their own nests the following year.

Sweat bee. Credit: Glenn Seplak

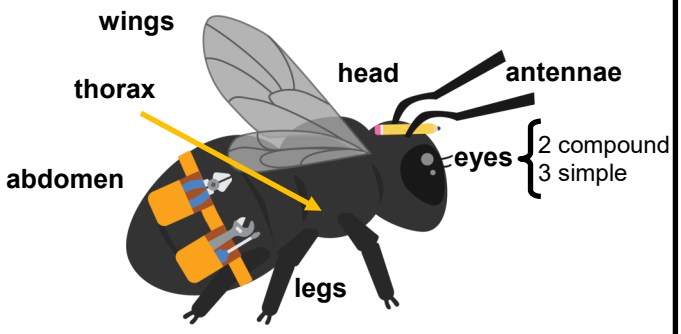
Bee Banquet

Bee diversity is highest in arid parts of the world, and the Sonoran Desert Region is a bee hotspot. One reason is the rich variety of flowering plants found here – it’s a bee banquet! Some native bees are generalists and dine on a wide assortment of plants. Others are “picky” eaters that specialize on just a few host species. Thus, different bee species may be active at different times and for very short periods. Some native bees enjoy the bountiful spring blooms of palo verde and ironwood trees or prickly pear and cholla cacti. Others emerge with the monsoon rains and feed on the plants, like sunflowers, that flourish from these storms.

Power Pollinators

As they forage among the flowers, bees carry pollen from one to another and help plants to reproduce. Their pollination services produce fruits, seeds, and nuts in myriad plant species that support animals all the way up the food chain, including people. One in three bites of food we eat, and products like fibers and medicines, all come to us because a pollinator stuck its face in a flower. Bees are the most effective pollinators of all.

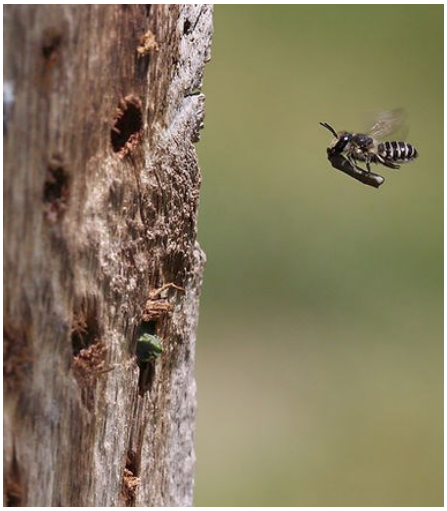
Bee Anatomy: Built for the Job



Female bees have specialized hairs on their legs or abdomens that they use to collect and carry pollen and floral oils and are like “flying tool kits with combs, mops, sponges, rakes and brushes.” (Danforth, 2019*)

Bee Heroes

Pollination is but one of the many ecosystem services that these tiny beings perform largely unnoticed. Yet they keep our world livable. We are in the midst of a biodiversity crisis, but we can counter this and help native bees continue their important work. How? We can plant native plants that provide food. We can preserve or build nesting places: keep dead tree stumps and flower stalks or make bee houses for cavity nesters, or leave bare earth for ground nesters. We can refrain from using pesticides. Similar to the cumulative benefits their tiny efforts make in our ecosystems, our collective efforts can add up to make a big difference for bees!



Leaf cutter bee using holes drilled in wood for bee houses.
Credit: Joseph Wilson

The Bee Heroes curriculum celebrates the incredible diversity and importance of our wild bee neighbors. It spotlights six species from the four largest bee families in our region and illustrates their varied appearances, lifestyles, food preferences, and nesting needs. For more in-depth information on these species, see the accompanying Bee Heroes Species Chart, the Desert Museum Bee Kit Background Reading and sources* and (eventually) the *Beatriz the Builder Bee* Glossary in the unit resources.

ARIZONA-SONORA DESERT MUSEUM in partnership with FW TUCSON BEE COLLABORATIVE INSTITUTE of Museum and Library SERVICES