Know Your Native Bees

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This presentation based on:

Bee Basics,
An Introduction to Our Native Bees

USDA Forest Service and Pollinator Partnership Publication

By Beatriz Miosset, Ph.D.
and
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Native bees

- 4,000 native bee species in the U.S.
- Most of the pollination of native plants is done by native bees
- Honey bees are not native since they were brought here by European settlers

Native bees

- Pollinate 80% of the 250,000 flowering plant species in the world
- Bees pollinate approximately 75% of the fruits, nuts and vegetables grown in this country
**Southeastern Blueberry Bee**

- Can visit as many as 50,000 blueberry flowers and pollinated enough to produce more than 6,000 ripe blueberries
- 6,000 blueberries are worth $20 or more

**Bees and Wasps**

- Bees evolved from predaceous wasps starting some 125 million years ago when the first flowering plants evolved
- Wasps are carnivores, predators or parasitoids of other insects and spiders
- Some wasps switched to utilizing nectar for energy and the pollen for protein and over time, adaptations enabled them to better utilize this resource and evolve into bees

**Social and Solitary Bees**

- Solitary bees live alone as adults and raise their brood alone
- Social bees (honey bees, yellow jacket wasps, hornets) have annual colonies of many individuals
Social Bees

- An over-wintering queen emerges in the spring, builds a nest, lays eggs and collects food for the resulting larvae.
- The female worker adults emerge to work together to feed and care for the colony until fall when new queens emerge, mate and hibernate until spring when the cycle begins anew.

Pollen Transport Structures, Called Scopae

- Made of stiff hairs located on the hind legs or under the abdomen.
- Bees frequently brush themselves, gathering pollen grains from their body's feathery, branched hairs and transfer the pollen grains to their scopae.
- Bees have branched hairs that distinguish bees from wasps.

Ecologically, bees can be separated into two groups based on the relative length of mouthparts:

- Long-tongued bees like Apidae and Megachilidae favor deep flowers with a longer throat, although they can feed on open flat flowers.
- Short-tonged bees are more limited in their floral choices (shallow flowers, such as those of the daisy or aster family and those of the carrot family).

Long-tongued Bees vs Short-tongued Bees

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Osmia cornifrons
Hornfaced Bee
Note long tongue
Family Megachilidae


Image courtesy of Beatriz Moisset
Nesting
- All bee families have species that care for their young by building nests and provisioning the nests with pollen, nectar, and saliva before laying their eggs, and sealing them to protect the larvae.
- They generally mix dry pollen with some nectar and knead it into a pollen loaf.
- Their saliva provides protection against some bacterial and fungal infections.

Cuckoo Bees
- Cuckoo bees are species from three bee families that lay their eggs in the nests of other bee species.
- Some cuckoo bee species kill the host’s larvae before laying their egg.
- The majority of cuckoo bee larvae feed on the stored food and the host larvae.
- Cuckoo bees are often mistaken for wasps.

Types of nests
- Some native bees build underground nests.
- Others use hollow stems or holes in trees usually left by beetles or some chew holes in the wood.

Solitary Bees, Honey Bees and Bumble Bees Provide Mass Provisioning
- Each cell is provisioned with all the food required by the larva to become an adult.
Underground Nest Provisioned With Bright Orange Pollen Masses

Miners or Digger Bees Dig their Nests in the Ground

- The brood cell is provisioned with enough pollen and nectar for just one bee to grown from egg to adult
- The egg is laid and the chamber is sealed

Hole-Nesters: Mason and Leafcutter Bees

- Make nests in hollow stems or holes made by wood-boring beetles or other insects in dead wood
- Others use rock crevices or surfaces to form their nests
- Brood cells, usually lined up end-to-end in a row, which each serve as nurseries and growth chambers for larvae, pupae and young adults

Hole Nesters: Mason and Leafcutter Bees

- Mason bees use mud to construct partition walls between adjacent cells and a thicker plug to seal the nest entrance from parasitoids
- Leafcutter bees cut rounded leaf pieces to line the inner walls of nest burrows

Bee Houses/Walls

- Paper drinking straws can be tied together or hollow twigs such as elderberry can be packed horizontally into a container such as a small milk carton facing south or southeast
- Close the opposite end of the straws by gluing the back ends into your carton
- A block of wood (scrap lumber) can also have holes drilled in it while instructions are available on-line
Bee Walls

Carpenter Bees

- Chew holes in wood with powerful mandibles
- They create “particle board” spiral partitions between cells

Eastern Carpenter Bee

Excavated Nest in Wood

Generalists vs Specialists

- Bumble bees are generalists that depend on a succession of plants flowering from early spring when the queen emerges to early fall when the colony dies
- Other bees specialize in foraging, they resort to using pollen from only one or two families of flowering plants
- Specialists may collect nectar from a wider range of blossoms than they visit for pollen

Specialist Bees

- Squash bees are efficient pollinators of cucurbit plants
- Blueberry bees
- *Macropis* spp. Collect oil and pollen on loosestrife flowers (*Lysimachia*) – they must visit other plants for nectar

Squash Bees

- About the same size and brownish coloration as honey bees
- They pollinate flowers faster than honey bees
- They begin working the cucurbit flowers at or before dawn when the flowers are opening while honey bees arrive later in the day
**Peponapsis pruinosa**  
Pruinose Squash Bee or Common Squash Bee  
Family Apidae

Image courtesy of Beatriz Moisset

**Apidae**  
(honey bees, bumble bees, carpenter bees, squash bees, southeastern blueberry bees, and cuckoo bees)

- Bumble bees -- 50 species in North America
- Large, furry and mostly black with yellow, white or bright orange stripes
- More social that most other native bees although their colonies are not as big or long lived as honey bees

**Bumble Bee**

Image courtesy of Alan Windham, UT Extension

**Pyrobombus impatiens**  
Common Eastern Bumble Bee female  
Family Apidae

Image courtesy of Beatriz Moisset

**Apidae**  
(honey bees, bumble bees, carpenter bees, squash bees, southeastern blueberry bees, and cuckoo bees)

- Bumble bees and honey bees have specialized pollen baskets, called corbiculae, on their hind legs
- The tibial segment of the hind leg is flattened with rows of long strong setae (hairs) along the edges
- The basket can be packed with pollen, mixed with nectar and saliva, into a tight mass called a corbitular pellet

**Bombus bimaculatus**  
Two-spotted Bumble Bee male  
Family Apidae

Image courtesy of Beatriz Moisset
**Bumble Bees**

- The impatient bumble bee is used as a pollinator of greenhouse tomatoes
- All that is needed is a queen, a box for a nest, and a supply of sugar water because tomatoes don't produce nectar
- Bumble bees are important pollinators of some clovers

**Carpenter Bees**

- Unlike bumble bees that are fuzzy all over, carpenter bees are practically hairless on the upper abdomen, appearing glossy
- In early spring, males competing for females chase away other males or might even buzz humans but they can't sting
- Carpenter bees often cut a slit at the base of the flower to get at the nectar without coming near the pollen dispensing anthers or the stigma of the flower

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**Xylocopa virginica**

*Eastern Carpenter Bee*

*Family Apidae*

Image courtesy of Wikipedia

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**Carpenter Bee Damage**

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**Small Carpenter Bees**

- Much smaller than carpenter bees, they nest in pithy stems, such as blackberry or roses

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**Ceratina calcarat**

*a Small Carpenter Bee*

Image courtesy of The Packer Lab - Bee Tribes of the World
Southeastern Blueberry Bees (SEBB)

- Forages primarily on blueberries and are only active for a few weeks each year.
- Faster and more efficient pollinators of blueberries than honey bees.
- The SEBB vibrates her flight muscles very rapidly causing the whole flower to vibrate.
- This buzz pollination (sonication) causes pollen to shake out of the anthers onto her body and it also causes pollen clinging to her body to attach to the stigma.


Southeastern Blueberry Bees

A USDA Forest Service
and Pollinator Partnership Publication

Bee Basics

Tribe Eucerini
Long-horned Bee Female
Family Apidae

Megachilid Bees

- This family contains mason bees and leaf-cutter bees.
- They carry pollen on the underside of their abdomens instead of carrying pollen on their back legs.
- The blue orchard bee pollinates fruit trees.

Megachile Subgenus Xanthosarus sp.
Family Megachilidae

Blue Orchard Bee

Image courtsey of Beatriz Moisset

Image courtesy of Beatriz Moisset
Some of the most beautiful bees with their shiny metallic-colored bodies (green, blue to copper or gold, and sometimes even black)

- *Augochlora pura* (name means pure magnificent green bee) builds its nest under the bark of a rotting log
- *Agapostemon* species - green, yellow and black-striped
**Pure Green Augochlora**

- Female builds nest under bark of rotten logs, adds her saliva and secretions to loose, half rotted wood to build an envelope for her eggs and accumulated pollen.

- She kneads the pollen into a number of tiny loaves shaped like tiles which are plastered on the wall of the broad chamber and then lays an egg and seals the cell completely to keep out ants and other predators.


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**Halictus rubicundus**

- **Sweat Bee Female**
- **Family Halictidae**

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**Bee Nests Aggregation of**

- **Lasioglossum zephyrum**
- **(Zephyr Dialictus)**
- **Family Halictidae**

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**Andrenidae - Miner Bees**

- All ground nesters and mostly dark, black or reddish, but can be metallic blue, yellow, or red and yellow

- Velvety patches (foveae) on their faces between the eyes and the base of the antennae

- Most are active only in the early spring where they visit willows, maples, apples, violets and other wildflowers

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**Andrena Subgenus Gonandrena**

- **Dogwood Andrena**
- **Family Andrenidae - Mining Bees**

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**Andrena Subgenus Simandrea nasonii**

- **Nason’s Andrena**
- **Family Andrenidae – Mining Bees**

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**Andrena sp.** female on azalea family Andrenidae – Mining Bees

- Image courtesy of Beatriz Moisset

**Collectidae** (Cellophane Bees)

- Some such as the yellow-masked bees, Hylaeus, do not have pollen baskets since they carry pollen in their crops.
- They are not as hairy as other bees and can be mistaken for wasps.
- They all nest in pithy stems.
- Sometimes they form large aggregations of nests and use a cellophane-like material exuded from glands to line the brood cells.

**Colletes americanus** species group

Cellophane Bees, Family Colletidae

- Image courtesy of Beatriz Moisset

**Honey bees are not native**

- Honey bees do not pollinate tomato or eggplant flowers.
- Honey bees do very poorly compared to native bees when pollinating many native plants, such as pumpkins, cherries, blueberries, and cranberries.
- Honey bees are valuable because they can be transported to fields where needed, they can pollinate as long as the weather permits, and huge numbers can be brought in for pollination.

**Honey Bee Swarm**

Family Apidae

- Image courtesy of Beatriz Moisset

**Questions?**
Programs in agriculture and natural resources, 4-H youth development, family and consumer sciences, and resource development. University of Tennessee Institute of Agriculture, U.S. Department of Agriculture and county governments cooperating. UT Extension provides equal opportunities in programs and employment.