Know Your Native Bees

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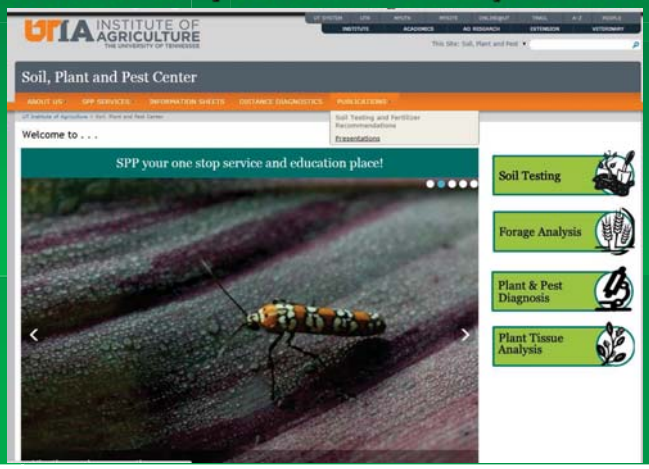
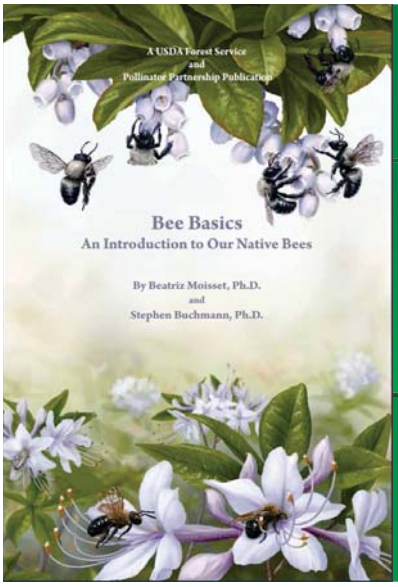


This presentation based on:

Bee Basics, An Introduction to Our Native Bees

USDA Forest Service and Pollinator Partnership Publication

By Beatriz Miosset, Ph.D.
and
Stephen Buchmann, Ph.D.



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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

Habropoda laboriosa
Southeastern Blueberry Bee
Family Apidae

Image courtesy of Hannah Burrack, NCSU

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

Paper Wasp Chewing Caterpillar into a Ball to Feed to Larvae in Nest

Paper wasp image courtesy of Terrence Godfrey, photojournalist

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

Yellowjackets

Image courtesy of Alan Windham

Pollen Transport Structures, Called Scopae

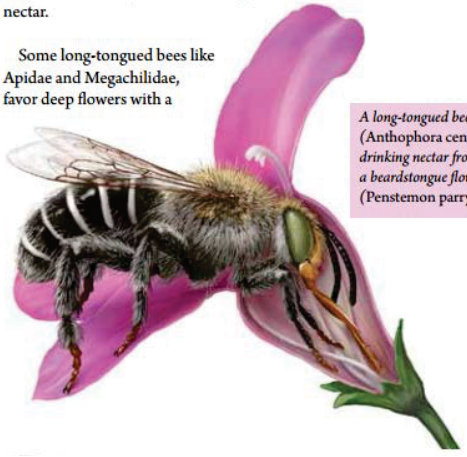
- Made of stiff hairs located on the hind legs or under the abdomen
- Bees frequently brush themselves, gathering pollen grains from their body's feathery, branched hairs and transfer the pollen grains to their scopae
- Bees have branched hairs that distinguish bees from wasps

Long-tongued Bees vs Short-tongued Bees

- 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

Ecologically, bees can be separated into two groups based on the relative length of mouthpart segments within their tongues, called proboscides. The long and short tongues are used to gather nectar.

Some long-tongued bees like Apidae and Megachilidae, favor deep flowers with a



A long-tongued bee (Anthophora centriformis) drinking nectar from a beardstongue flower (Penstemon parryi).

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Osmia cornifrons
Hornfaced Bee
Note long tongue
Family Megachilidae

Image courtesy of Beatriz Moisset

A short-tongued bee in the genus Colletes *taking nectar from the shallow florets of a sunflower* (Helianthus annuus)

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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

Nomada sp. Cuckoo Bee female Family Apidae

Image courtesy of Beatriz Moisset

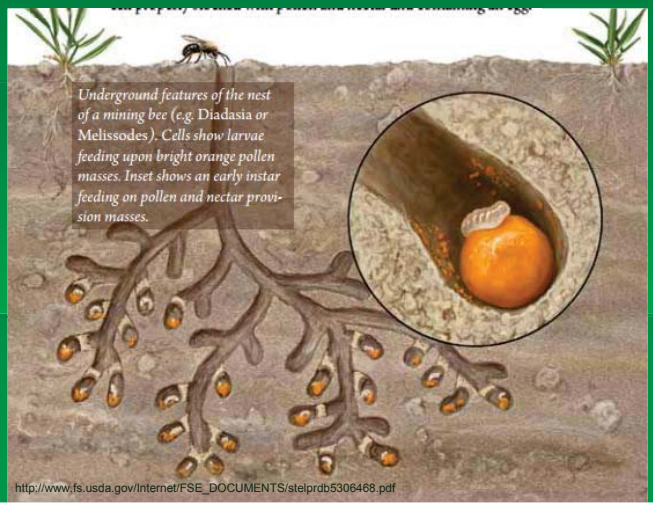
Types of nests

- 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



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Miners or Digger Bees Dig their Nests in the Ground

- Bare, sunny spots with little chance of flooding are usually chosen
- Long tunnels are excavated (can be a foot deep or more)
- A chamber wider that the tunnel (brood cell) is constructed at the end of the tunnel and often other branches with brood cells are made

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

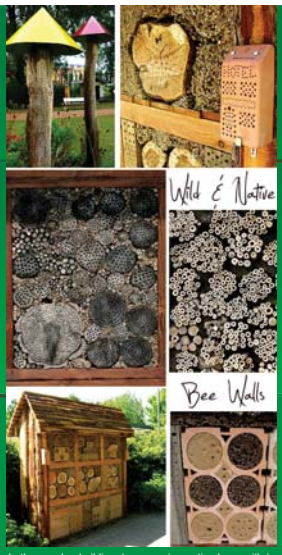
Hole Nesters: Mason and Leafcutter Bees

- 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

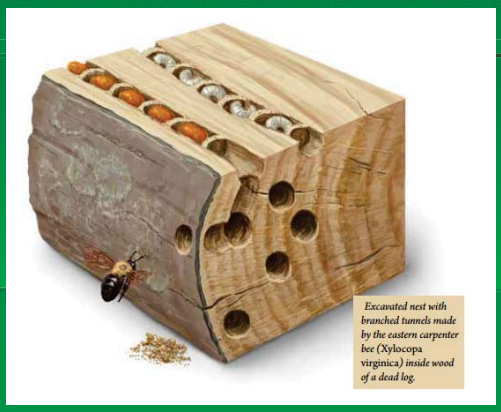


http://pithandvigor.com/daily-garden/shop-for-garden-products/shed-other-garden-buildings/encouraging-native-bees-with-insect-walls/

Carpenter Bees

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

Eastern Carpenter Bee Excavated Nest in Wood



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Generalists vs Specialists

- Bumble bees are generalists that depend on a succession of plants flowering from early spring when the queen emerges to 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 Moisette

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

Xylocopa virginica
Eastern Carpenter Bee
Family Apidae

Image courtesy of Wikapedia

Carpenter Bee Damage

Small Carpenter Bees

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

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

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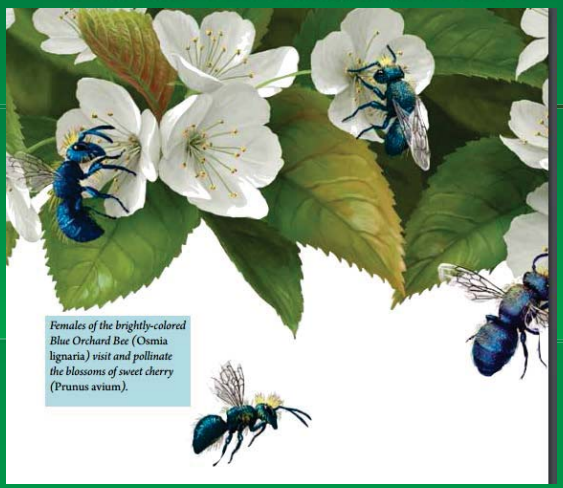
Tribe Eucerini
Long-horned Bee Female
Family Apidae

Image courtsy of Beatriz Moisset

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

Blue Orchard Bee



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Megachile Subgenus *Xanthosarus* sp.
Family Megachilidae

Image courtesy of Beatriz Moisset

Megachile sp.
Big headed Bee male
Family Megachilidae

Image courtesy of Beatriz Moisset

Coelioxys sp.
Cuckoo-Leaf-Cutter Bees
Family Megachilidae

Image courtesy of Beatriz Moisset

Halictidae
Sweat Bees

- 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

Metallic Green Bee
Agapostemon sp.
Family Halictidae

Image courtesy of Beatriz Moisset

Lasioglossum sp.
Sweat Bee Female
Family Halictidae

Image courtesy of Beatriz Moisset

Augochlora pura
Pure Green Augochlora
Family Halictidae - Sweat Bees

Image courtesy of Beatriz Moisset

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

Image courtesy of Beatriz Moisset

Bee Nests Aggregation of Lasioglossum zephyrum
(Zephyr Diallictus)
Family Halictidae

Image courtesy of Beatriz Moisset

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

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

Image courtesy of Beatriz Moisset

Andrena Subgenus *Simandrea nasonii*
Nason's Andrena
Family Andrenidae – Mining Bees

Image courtesy of Beatriz Mosset

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

Questions?

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