

Bee Pollinators

They will never ask, but they need our help.



DAVIDSON COUNTY UTEXTENSION INSTITUTE OF AGRICULTURE THE UNIVERSITY OF TENNESSEE

Presented by:
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UT Extension Tennessee MASTER GARDENER

Bees need our help!

- Bee communities, both wild and managed, have been declining over the last half century as **pesticide use** in agricultural and urban areas increased.
- **Changes in land use** have resulted in a patchy distribution of food and nesting resources that are necessary for bees.
- Now more than ever, it is critical to consider practices that will benefit pollinators by providing habitats free of pesticides, full of nectar and pollen resources, and with ample potential nesting resources.

Why are bees important?

- It has often been said that bees are responsible for **1 out of every 3** bites of food we eat.
- **Most crops grown for their fruits** (including vegetables such as squash, cucumber, tomato and eggplant), **nuts, seeds, and fiber** (such as cotton), and **hay** (alfalfa grown to feed livestock), require pollination by insects.
- Pollinating insects also play a critical role in maintaining **natural plant communities** and ensuring production of seeds in most flowering plants.

Bees are Important

- The main insect pollinators, by far, are bees.
- **European honey bees** are the best known and the most widely managed pollinators.
- However, there are also **hundreds of other species of bees**, mostly solitary ground nesting species, that contribute some level of pollination services to crops and are very important in natural plant communities.

Why are bees good pollinators?

- Because most of their **life is spent collecting pollen**, a source of protein that they feed to their developing offspring.

- Individual bees tend to **focus on one kind of flower at a time**, which means it is more likely that pollen from one flower will be transferred to another flower of the same species by a particular bee.

- The business of collecting pollen requires a lot of energy, and so many flowers attract and **reward bees with nectar**, a mixture of water and sugars produced by plants.

Where and how do bees live?

- Most bee species **dig nests in soil**, others **utilize plants**, either by boring holes in pithy plant stems or wood, or by nesting in galleries made by wood-boring beetles in trees or other preexisting cavities.

- **Bumble bees** will nest in **abandoned rodent burrows**.

- **Feral honey bees** are known to nest in **tree hollows**.

- Most bees line their nest cells with a **waxy material** they produce themselves, but others use **pieces of leaves**, small pebbles mixed with **resin from tree sap**, or **mud** to form the cells in which they lay their eggs.

Why do bees need flowers throughout the growing season?

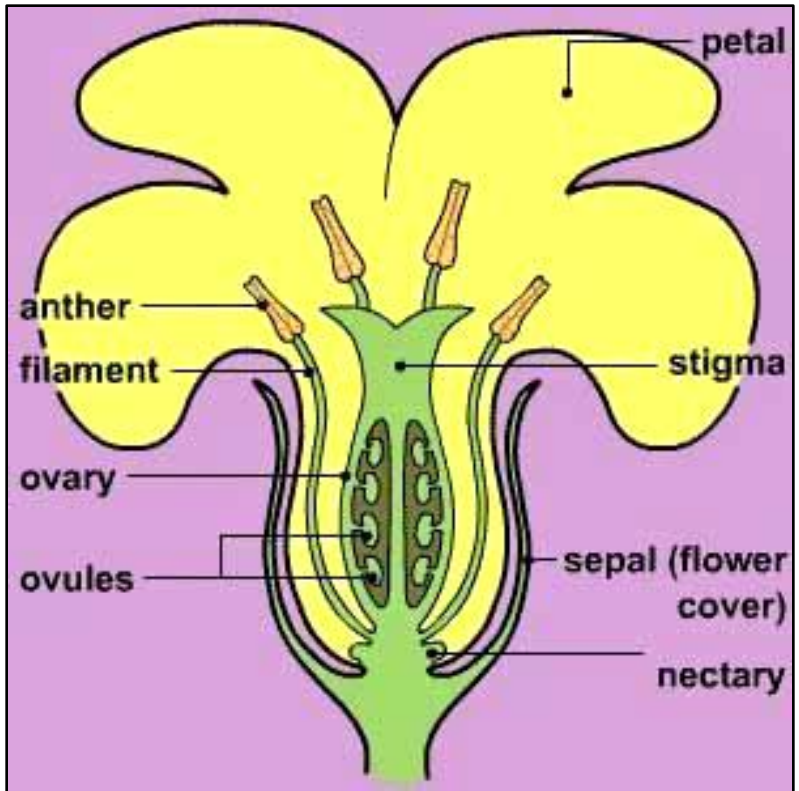
- Many bee species are **solitary**, with only one generation of bees produced per year.
- Other types of bees produce **multiple generations** per year.
- This means that bees that produce multiple generations each year need food resources across most of the growing season to produce strong colonies.
- Providing plants in a landscape with overlapping bloom periods will help these bees survive and prosper.

Bee Nutrition

- **Pollen:** Pollen is the sole dietary **source of protein** for bees. Bees absolutely require pollen from a variety of plants to feed to their offspring (larvae).
- The protein level in pollen from different plant sources ranges from 2.5 to 60 percent, and bees prefer pollen with high protein levels. Pollen also contains some lipids, sterols, vitamins, minerals, and carbohydrates.
- **Nectar:**
  Bees also visit flowers for nectar, another dietary reward produced by the plant.
- Nectar is a sugary plant secretion that also contains trace amounts of amino acids, proteins, lipids, and vitamins and is the main dietary **source of carbohydrates** for bees.

Nectar

- Nectar is produced by glands called **nectaries**.
- Nectaries can be located on any part of a plant, but the most familiar nectaries are those located in flowers (called "floral nectaries").



It’s a messy job, but bees don’t mind doing it.

Bee Flowers

- Specifically, the flowers that are attractive to bees have evolved **odors that are sweet and light**.
- These flowers have evolved **color patterns** that fall within the visual range of bees.
- Bees are not sensitive to light in the red spectrum, but they are sensitive to wavelengths in the ultraviolet spectrum.

(**What we see)** **(What bees see)**

(What we see) **(What bees see)**

Honey Bees

- Honey bees are not native to the USA, but are **European in origin**, and were brought to North America by the early settlers.
- Honey bees are **social insects**, consisting of large colonies, which include a queen, workers (females), and Drones (males).
- Honey bees are most active between **60º F. and 105º F**.
- Winds above **15 mph** reduce their activity and stop it completely at about **25 mph**.
- Although they may fly as far as **5 miles** in search of food, they usually go no farther than **1 to 1-1/2** miles in good weather.
- In unfavorable weather, bees may visit only plants nearest the hive.
- They also tend to work closer to the hive in areas where there are large numbers of attractive plants in bloom.

≈ 30% of bees nest in cavities

In Hollow Plant Stems	In Holes in Wood
• Carder Bees • Mason Bees • Small Resin Bees • Small Carpenter Bees • Large Carpenter Bees • Leafcutter Bees • Yellow-Faced Bees	• Mason Bees • Digger Bees • Leafcutter Bees • Small Resin Bees • Small Carpenter Bees • Large Carpenter Bees

Stem-Nesting Bees

Mason Bee Nest

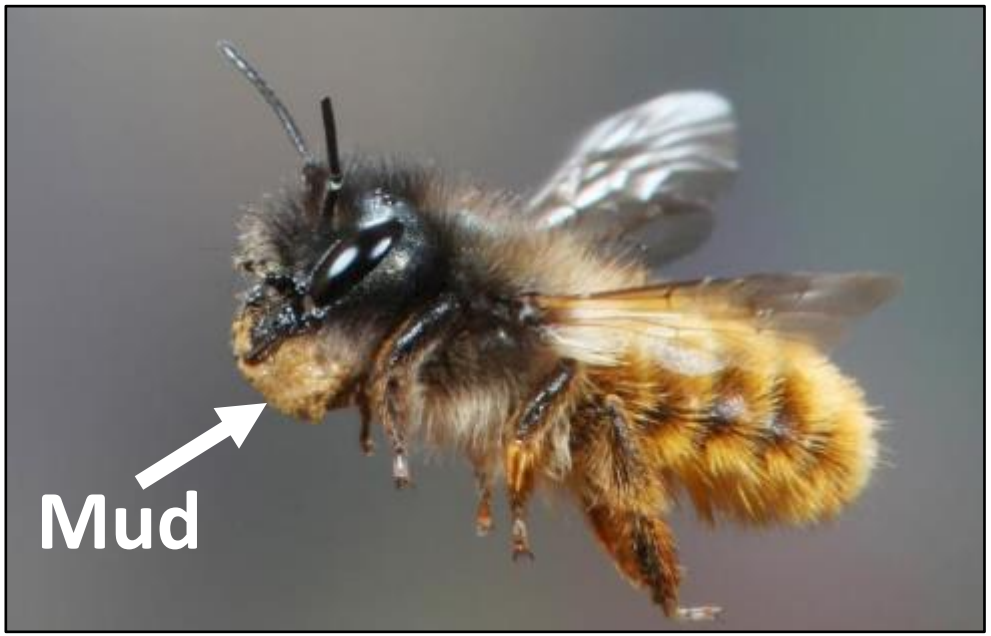
Leaf Cutting Bee Nest

Resin Bee Nest

Mason Bees

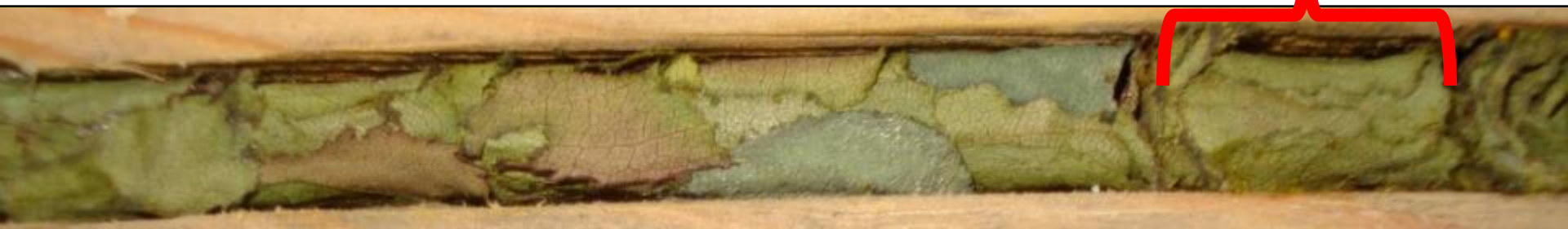
- There are **140 species** of mason bees in North America.
- They do not live in colonies, but construct solitary, **mud nests** within hollow stems, woodpecker holes, and insect holes found in trees or wood.
- Mason bees live a short life cycle of only **4 to 6 weeks** in the spring.
- Are pollinators of **fruit trees, vegetables, and flowers**.
- While **honey bees typically pollinate about 5 %** of the flowers they visit in a day, it is estimated that **mason bees pollinate 95 % of the flowers they visit.**

Mason Bees



Leaf Cutting Bees

- There are **about 242 species** of leaf cutting bees in North America.
- **Most species are solitary**, but some species will live in small colonies.
- Leaf cutting bees are also important **pollinators of fruits, vegetables, wildflowers, and other crops**.
- They use **cut leaves** to construct nests in cavities in wood or hollow stems.
- There are even some that nest underground.



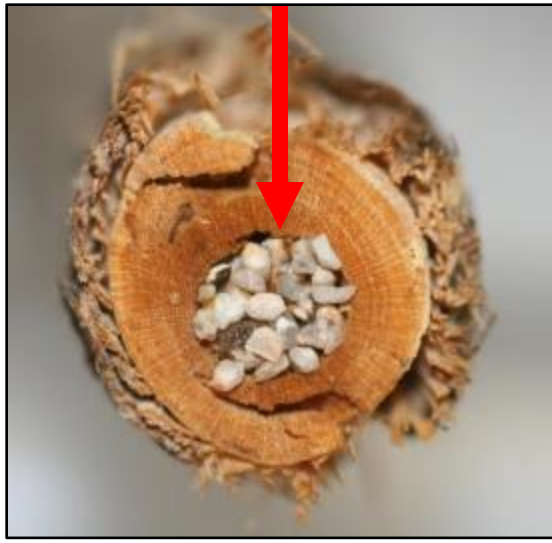
Leaf Cutting Bees

Small Resin Bees

- Resin bees are solitary nesting species that typically use **tree resin** and **small stones**, or other hard materials to create waterproof sheltering cocoons for their eggs.
- Due to the **waterproof nature of it's cocoons**, the resin bee can lay eggs in both protected (dry tunnels in the ground or wood) and unprotected spaces (notch of a tree branch).
- Resin bees are similar in size to both Orchard and Leaf-cutting bees, about 1/2 inch in length, and can **sometimes be found nesting in artificial bee boxes**.

Resin Bees

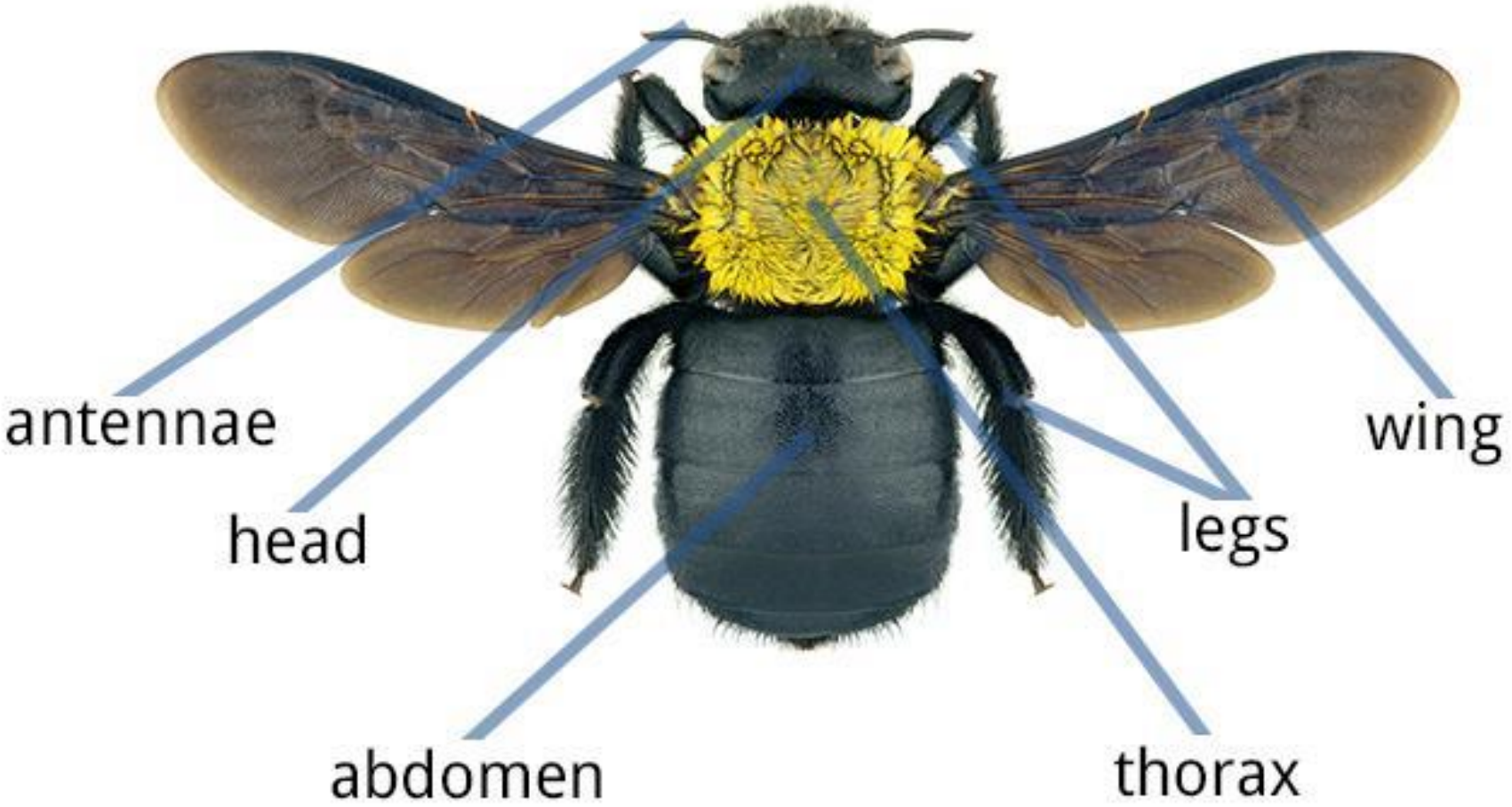
Nest entrance plugged with small stones and resin



Carpenter Bees

- Carpenter bees are large bees that closely resemble bumble bees.
- Unlike bumble bees, their abdomens are shiny, not hairy.
- These solitary bees emerge in early spring, excavate tunnels in solid wood, mate, and provision nests.
- Carpenter bees are notorious for **"robbing"** flowers by cutting slits in the side of the flower to reach nectar without even touching the pollinating parts.

Carpenter bee brood chambers with larvae



Nectar Robbing

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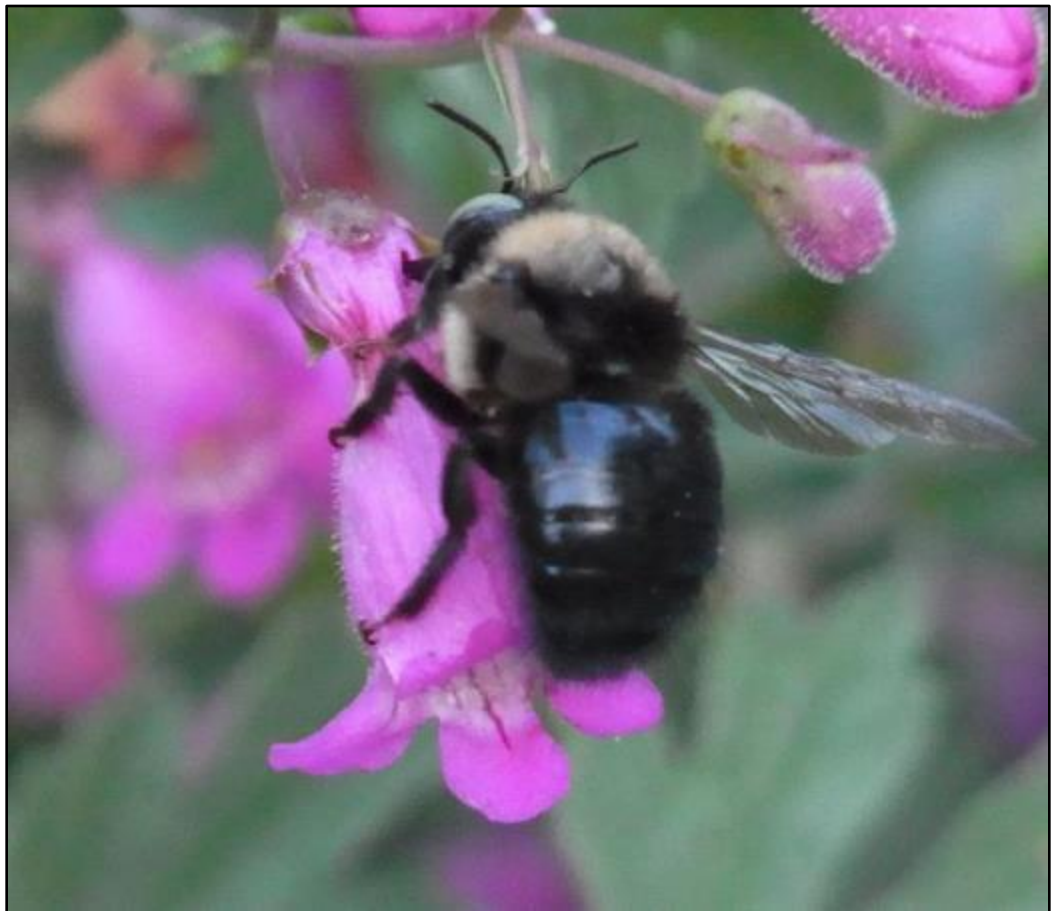


≈ 70% of bees nest in the ground

- Alkali Bees
- Bumble Bees
- Cellophane Bees
- Digger Bees
- Green Sweat Bees
- Leafcutter Bees

- Long-Horned Bees
- Mining Bees
- Squash Bees
- Sunflower Bees
- Sweat Bees

Bumble Bees

- **Over 40 bumble bee species** are native to North America.
- Their colonies are comprised of a queen, workers (females), and drones (males).
- Unlike honey bees, the bumble bee queen is the only bee out of the entire colony that survives through the winter.
- The following spring, each overwintering queen will find a new nesting site and start a new colony of bees.
- Bumble bees are active at temperatures **near 40 degrees F**, but **most active between 50 degrees F. and 86 degrees F**.
- They will **fly in winds up to 40 mph** and will stay active on **cloudy, foggy, and rainy days**.
- Bumble bees are more efficient pollinators than honeybees because they **mainly forage for pollen rather than nectar**.

Common Eastern Bumble Bee
Bombus impatiens

THE XERCES SOCIETY FOR INVERTEBRATE CONSERVATION

Native Bees in Decline

Some native bees in decline:

Four sister species of bumble bees

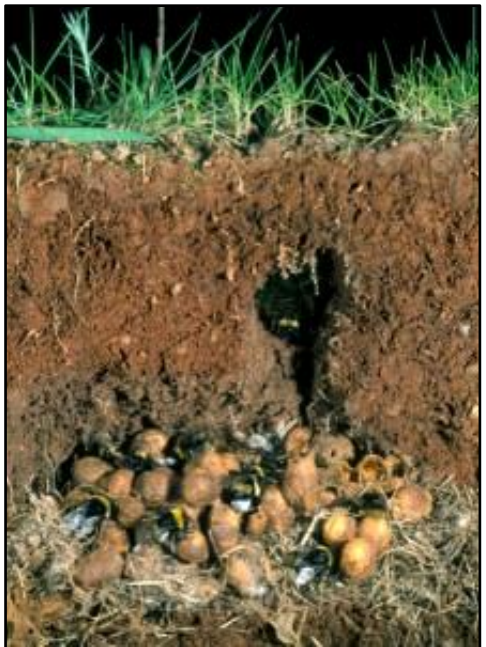
These bees are native to the western states.

Bombus impatiens in defensive posture

- The **raising of one of the middle legs** is always a sign to back off.
- The bumble bee won't sting, but it is disturbed by your presence.
- In this case it is probably the closeness of the camera, or human breath (they don't like mammal breath), or both.

Bumble Bee Nest

- Some nest underground, in places such as **abandoned rodent holes**, **under sheds** and in **compost heaps**.
- Above ground nests can be found in **thick grass**, **bird houses**, **lofts** and in **trees**.
- The light brown containers called honeypots are made of wax and are used to store food; others contain bee larvae.

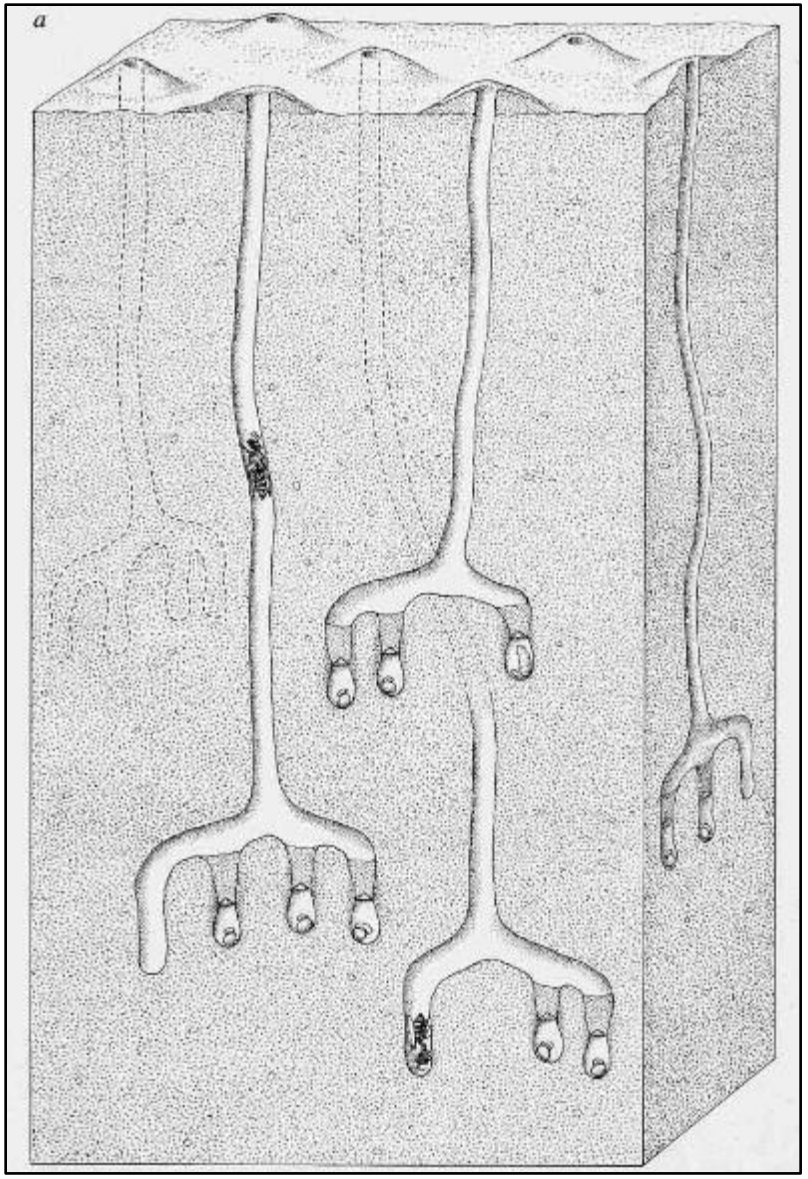


Solitary Ground Nesting Bees

- These bees **choose a bare, sunny spot** with little chance of flooding and start the task of digging, which may take several days.
- They excavate a long tunnel slightly wider than their own bodies.
- Ground bees may nest close together, but they still remain solitary, each bee digs her own nest and provisions her own brood.
- The underground burrow can be a foot long or even deeper.
- She may add other branches to the tunnel, properly stocked with pollen and nectar and containing an egg.

Underground Burrows with Brood Chambers

- At the end of the tunnel, the female bee builds a chamber (called a brood cell) a little wider than the tunnel.
- **She fills the brood cell with enough pollen and nectar for just one bee to grow from egg to adult.**



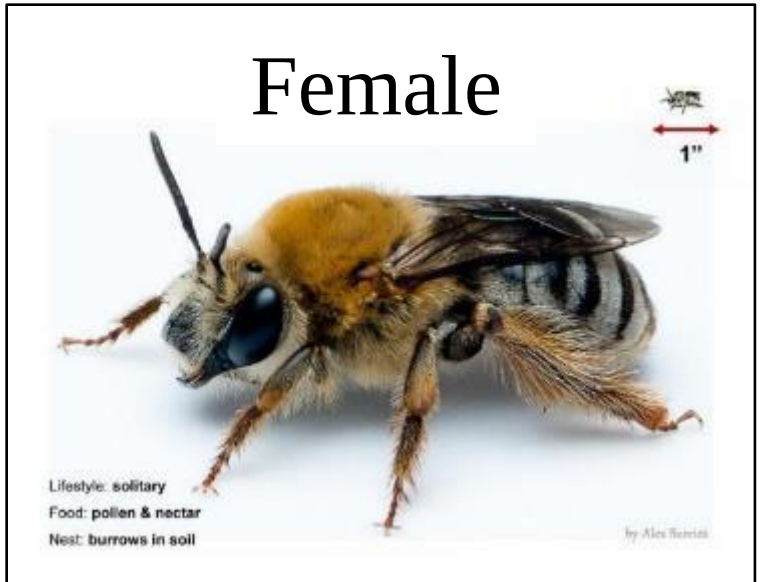
Solitary Ground Nesting Bees

Squash Bees

- Before Europeans brought honeybees to the New World, squash bees were busy aiding the adoption, domestication, spread, and production of squashes and gourds by indigenous peoples throughout the Americas.
- Fertilized female squash bees start foraging about one hour earlier in the morning than honeybees do.

Male

Female



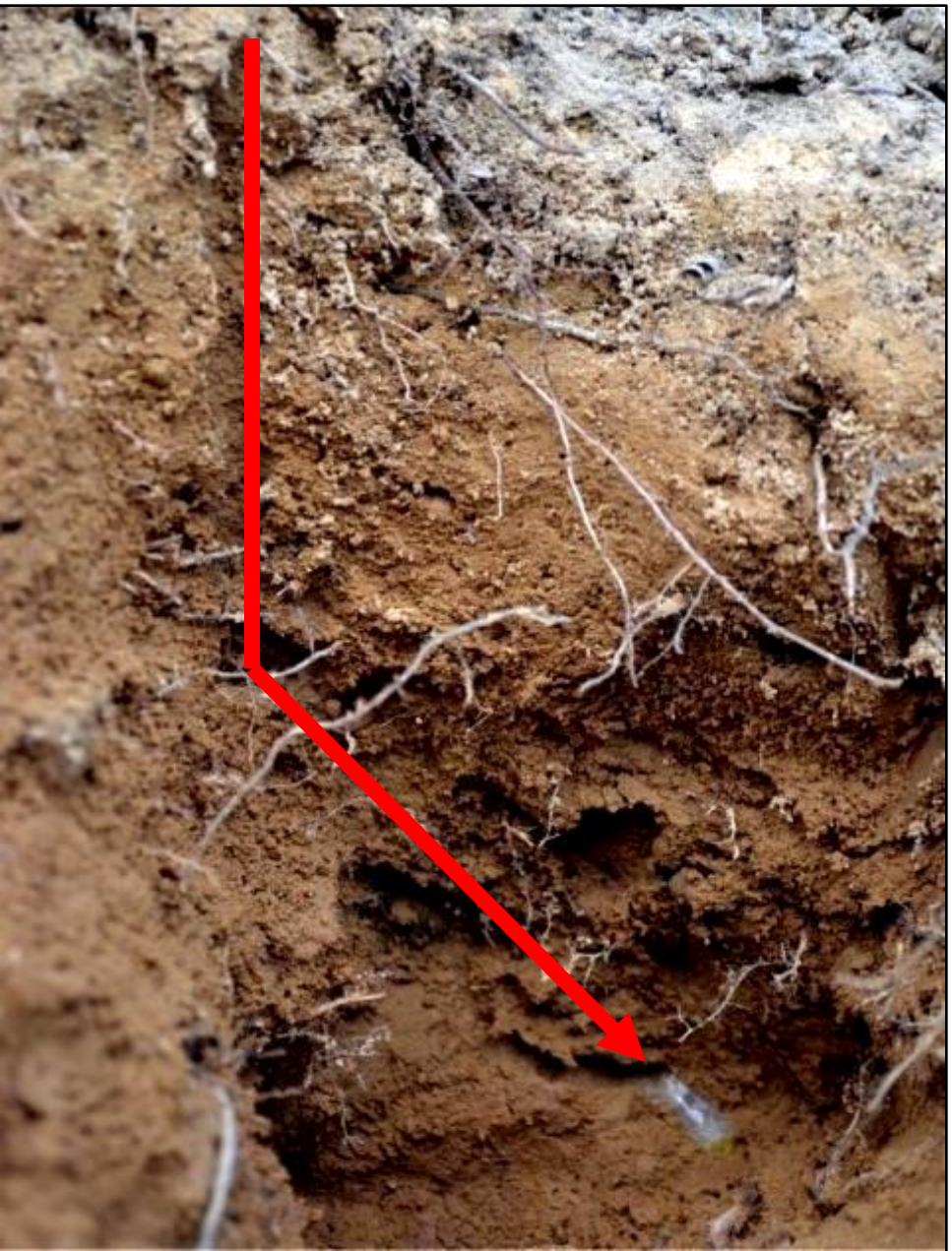
Squash Bees

- To an untrained eye, squash bees are easily mistaken for honeybees because of similar size and coloration.
- The squash bee has much more distinct light colored stripes on its abdomen and has combs, rather than a “pollen basket,” on its hind legs for carrying pollen.

Cellophane Bees

- There are over **100 species** of cellophane bees in North America.
- They are also commonly known as plasterer bees or polyester bees.
- The name is generally inspired by their secretion of a bio-plastic waterproof material of which the nest is made.
- The bees provision their cells by mixing pollen and nectar together to make a liquid “bee bread” for their offspring.
- Cellophane bees also secrete **"linalool“**, **a fungicide and bactericide** used to protect brood cells, from a gland near their mandibles.

Cellophane Bee Nest



A Cellophane Bee **has two stomachs**, the **first stomach is for eating** and the **other stomach is designed for storing nectar**, making it possible to carry it back to the hive.

Cellophane Bee Nest with Young Bee

Making Pollinators Sustainable

Tips for Creating a
Pollinator-Friendly Landscape

Include Native Plants

- Pollinators prefer native plants over non-native or introduced, but not exclusively.
- A typical suburban landscape contains only 20-30% native plant species.
- Try reversing that trend by using 70-80% native species.

Diversify Bloom Times

- A pollinator-friendly landscape has flowers in bloom throughout the entire growing season, providing a consistent supply of nectar and pollen.
- In addition to perennial flowers, many flowering trees and shrubs, annuals, and spring bulbs are also beneficial to pollinators.

Plant a Variety of Flower Colors

- The size, shape, and color of flowering plants all influence what types of pollinating insects will visit, so planting a diversity of flowers is the best way to attract a diversity of pollinators.
- **Bees** are more attracted to **purple, yellow, and white flowers** and less attracted to red flowers.
- **Red flowers** are more attractive to **butterflies and hummingbirds**.

Plant in Masses

- Many bee pollinators prefer to forage on the nectar and pollen from a single plant species during their foraging outings.
- Therefore, grouping plants in single-species masses of five to seven plants is more advantageous for the bees than having just one or two plants or dispersing them throughout the landscape.

Conclusion

- As bees of all kinds decline, that leaves behind a pollination vacuum.
- And less pollination means lower food quality, higher food prices, and threatened plant communities.
- Thus, large bee populations are in everyone's best interest.
- Anyone who grows or uses plant products is a stakeholder in bee conservation.