
Identifying Bees

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- 3rd year beekeeper

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Today's Topics

- Bee Basics
- Native Bees
- Honey Bee Basics
- Attracting Bees



Leafcutter Bee

Bee Basics

- Is This a Bee?
- Bee Anatomy
- Solitary Bees & Social Bees



Bumble Bee

Is This a Bee?



Mud dauber wasp

Paper wasp

Yellow jacket

Hover fly

Long-horned bee



Is This a Bee?



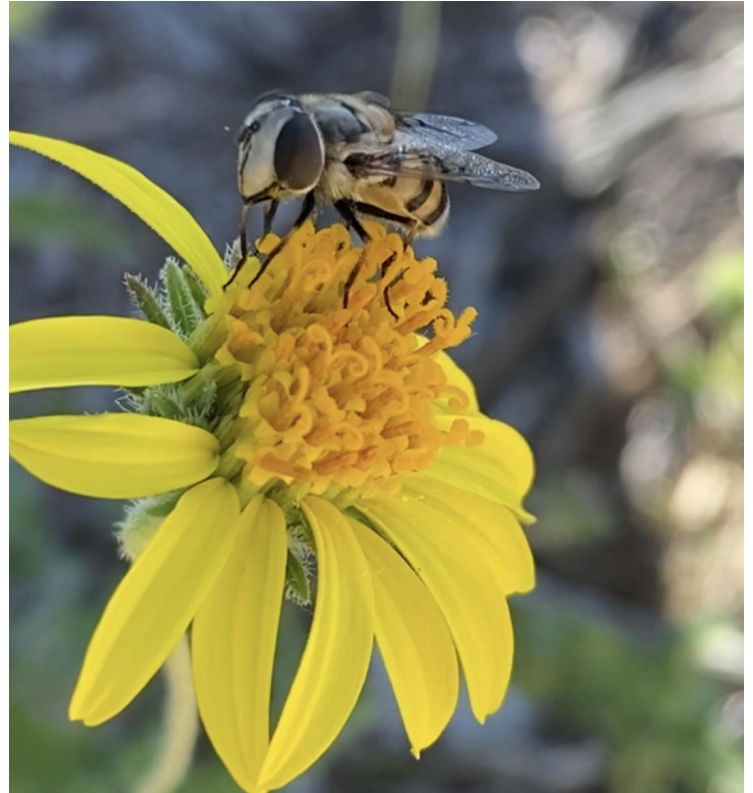
Mud dauber wasp

Paper wasp

Yellow jacket

Hover fly

Long-horned bee



Bee vs. Wasp (Differences)

Bee



- Thicker body
- Often hairy
- Pollen-collecting hairs
- Stout legs

Wasp

- Skinny body, narrow waist
- Generally hairless
- No pollen-collecting hairs
- Skinny legs



Bees vs. Fly (Differences)

Bee

- Long antennae
- Four wings
- Distinct thorax & abdomen
- Eyes on sides of head

Fly

- Short antennae
- Two wings
- Thick waist
- Large eyes, often forward



Basic Bee Anatomy for Today

©2011 Casey M Delphia



- Head
- Thorax
- Abdomen
- Antennae
- Pollen-carrying hairs

Two Kinds of Bees: Social & Solitary



Feral colony of the European honey bee. Courtesy of Cullen Hanks.

Two Kinds of Bees: Social & Solitary

90% of
Texas bees
are
solitary



Native ground-nesting solitary bee in nest. Courtesy of Michael Warriner.

Solitary Bee Nests

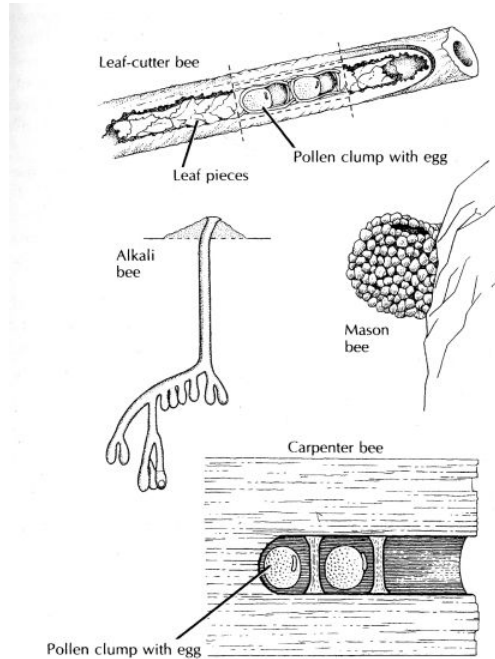


Fig. 2.2 Some of the different modes of nest construction used by solitary bees. The nest of the mason bee, *Hoplitis anthocopoides*, is constructed of pebbles glued together by glandular secretions. A leaf-cutter bee, *Megachile* sp., makes its nest in a hollow stem lined with fresh leaf pieces that envelop and separate the pollen balls of different cells. The nest of an alkali bee, *Nomia melanderi*, consists of cells branching from tunnels dug into the soil. The carpenter-bee, *Xylocopa* sp., deposits its pollen and eggs into holes bored into wood.

True Solitary: a single mated female raises brood in her solitary nest.

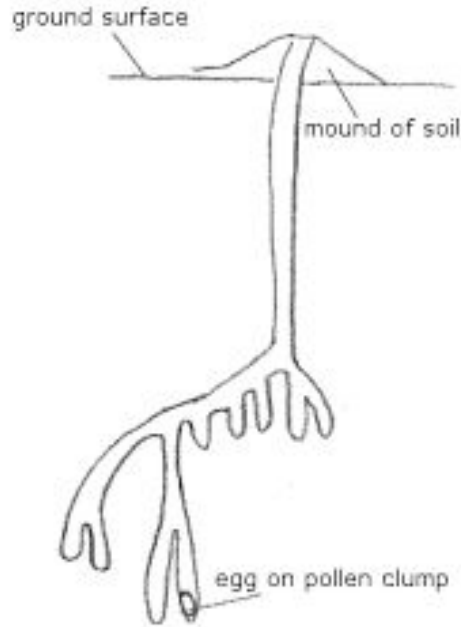
Communal: many mated females, each with her own nest, build their nest in an aggregation.

Carpenter Bee Nest (solitary cavity)



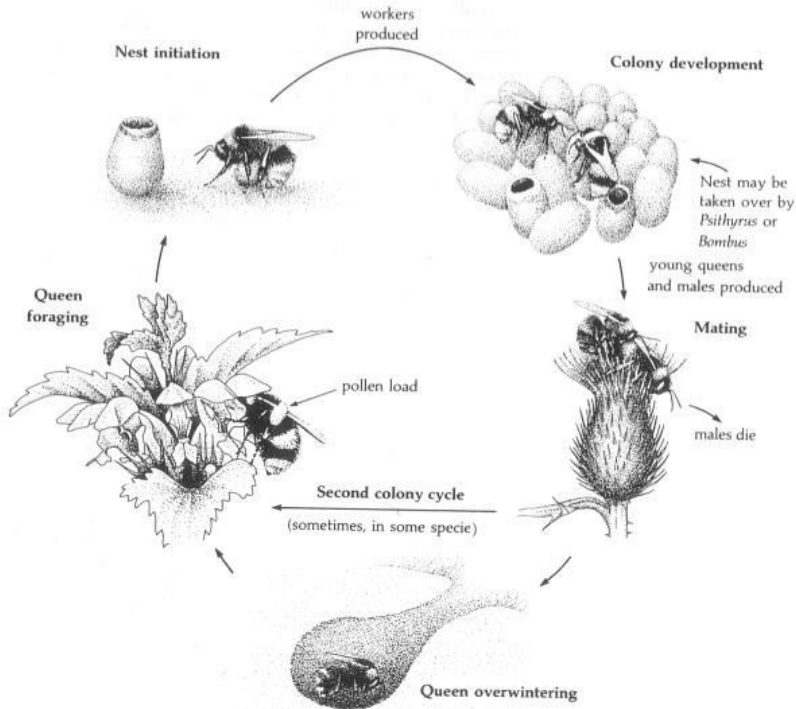
- Collects pollen for nest
- Lays egg on pollen ball
- Larva feeds on pollen ball
- Larva pupates and the next generation begins

Longhorn Bee Nest (solitary ground nester)



- Collects pollen for nest
- Lays egg on pollen ball
- Larva feeds on pollen ball
- Larva pupates and the next generation begins

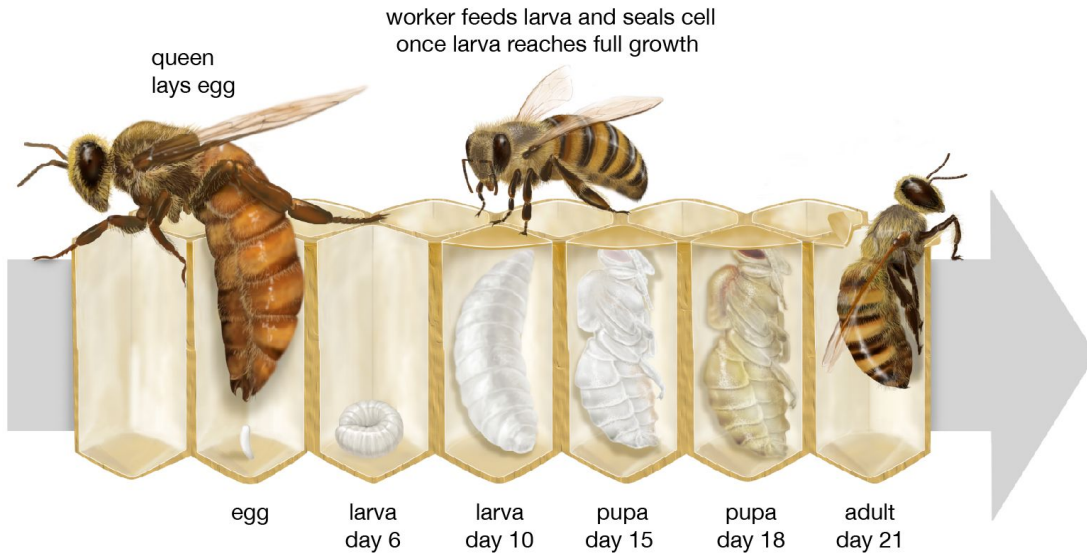
Social Bee Nests: Bumble Bee



Semi-social: a mated female makes her nest, forages, and produces worker daughters, who help her rear brood.

Honey Bee Nest (Highly social)

Life cycle of honeybees



Highly social: a mated queen exists solely to produce eggs.

She is supported by workers for nest building, foraging, and tending young

Native Bees

- Native Bee Numbers
- Identifying Characteristics
- Common Texas Bees



Large Carpenter Bee

Native Bees Numbers

- 20,000 native bee species around the world
- 4,000 species of bees in North America
- 800 identified species in Texas



"Mason bee feeds" by Nigel Jones

Native Bee Families of Texas

Apidae: Bumble bees, carpenter bees, long-horned bees, honey bees*

Colletidae: Plasterer bees

Andrenidae: Miner bees

Halictidae: Sweat bees

Melittidae: Oil-collector bees

Megachilidae: Leafcutter bees



"Green bee" by damack1d

*Non-native

Native Bee Families of Texas

Apidae: Bumble bees, carpenter bees, long-horned bees, honey bees

-Most recognizable bees, extremely hairy

Colletidae: Plasterer bees

-Apply a glue lining to walls of nests, generally hairy bees

Andrenidae: Miner bees

-Largest of the families, ground nesters



"Long-horned Bee" by Nick Wood

Native Bee Families of Texas

Halictidae: Sweat bees

-Common backyard bees, vary in shape and color, widespread

Melittidae: Oil-collector bees

-Oldest known bee fossil, least diverse family, small unassuming bees

Megachilidae: Leafcutter bees

-Carry pollen on their underside, diverse family, submarine-shaped



"Long-horned Bee" by Nick Wood

Native Bees Are Diverse: Similarities & Differences

We'll look at characteristics like:

Size

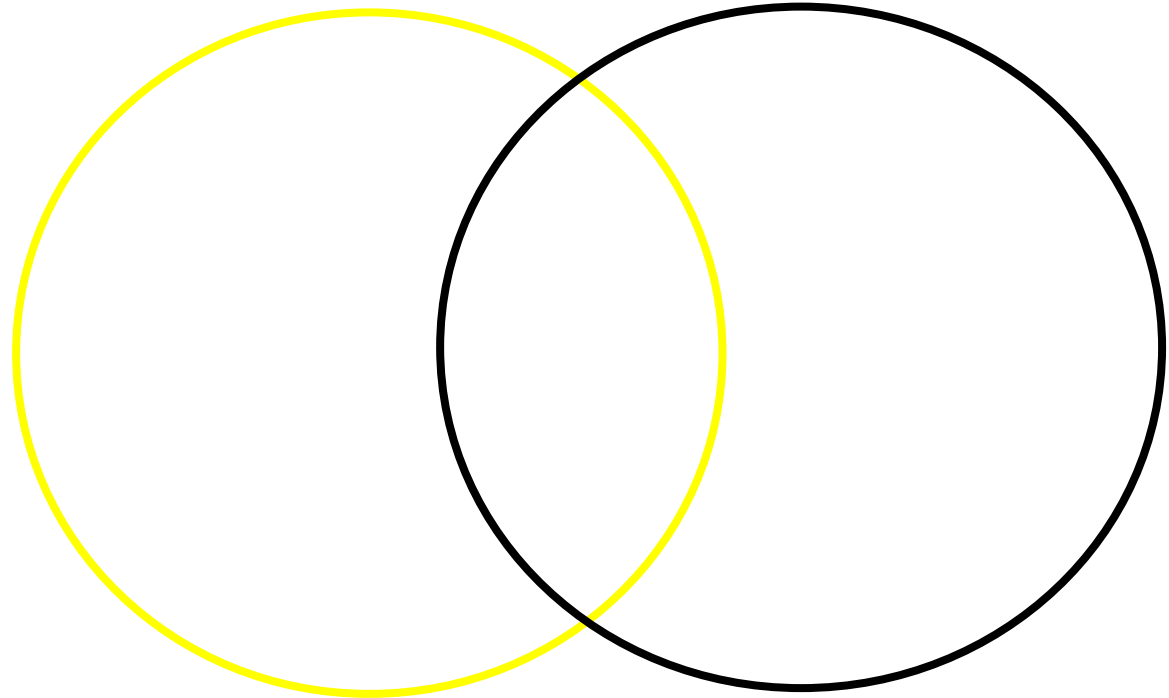
Shape

Color

Hair

Behavior

Nesting



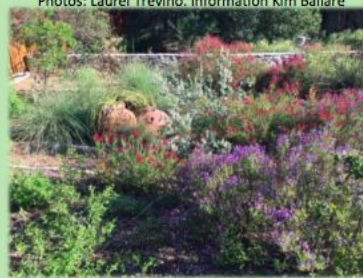
Identifying Bees Can Be Difficult

- Bees are fast, small and diverse
- Use reputable guides and websites for your region
- Mnemonic devices work for me. It helps me narrow down my choices
- Smart phone pictures/video
- iNaturalist App





Photos: Laurel Treviño, Information Kim Ballare



Central Texas gardens & farms have hundreds of native bee *species* including:



Longhorn bee - John Ascher 2009

1. Bumble bees (*Bombus*) most common in TX
2. Tiny sweat bees (*Lasioglossum*) most common
3. Longhorn bees (*Melissodes*) very common
4. Large carpenter bees (*Xylocopa*) common
5. Green sweat bees (*Agapostemon*) common
6. Leaf cutter bees (*Megachile*) less common



<https://w3.biosci.utexas.edu/jha/about-native-bees>



[Native Bee Resources](#)

TEXAS NATIVE BEES

The Jha Lab has been studying native pollinators since 2012.
 Researchers have identified hundreds out of the ~800 bee species and 6 families found in Texas.
 About 20,000 native bee species have been described around the world!

Carpenter bees (Apidae) are solitary but can live with sisters or daughters. Females bore holes in wood & partition nests with wood chips. Territorial males may fly at you but can't sting.



Sean McCann

Ceratina



Steve Nanz

Long-horned bees (Apidae) are solitary but may nest in large groups in the ground. Guess why *Melissodes* is called a long-horned bee!



Sean McCann

Laurel Treviño, Sarah Cusser
 S. Jha Lab – Integrative Biology
<http://w3.biosci.utexas.edu/jha>

Bumble bees (Apidae) are ground-nesters; they can forage > 1 km away.

Bombus



Charles Schurch Lewallen

Mining Bees (Andrenidae) are solitary bees. Most build underground nests: a small entrance leads to a branched tunnel containing an egg.



© Bruce Lund 2012



Dennis Briggs

Egg on pollen ball

Plasterer bees (Colletidae) chew leaves into spit balls to plaster their nests in pithy stems.

Colletes



Wikipedia

Female **parasitic bees** invade nests of other bees to lay eggs on the food stored by the host. These kleptoparasite larvae consume all the food (pollen).

Coelioxys



Lasioglossum



Steve Nanz

Sweat bees (Halictidae) are common. Most are ground-nesters like *Agapostemon* & *Lasioglossum*. Females can make individual cells in communally nests. Others are cavity nesters. They're called sweat bees because they lick salt from sweat.



©standingoutinmyfield

Agapostemon



Discoverlife.org

Scott Famous



Gardeners/farmers use mason bees like *Osmia* to pollinate crops. Some rear them commercially.

Megachile



Tai Roulston

Mason bees (Megachilidae) are solitary and docile; nesting in cavities, stems or snail shells! Females make mud walls between brood cells and mud packs to seal their nest.



© Chris Worden

Leafcutter bees (Megachilidae) pollinate well; one bee can pollinate as much alfalfa as 20 honey bees. They line cavity nests with pieces of leaves or petals.

Some (*Melittidae*) bees like *Hesperapis*, collect plant oils in dry climates.



Lynette Schimming



The University of Texas at Austin
 Department of Integrative Biology
 College of Natural Sciences



CENTRAL TEXAS KEY POLLINATORS



Nectaring housefly

ORDER DIPTERA - Flies
two wings (one pair),
bristles don't carry pollen,
have short thick antennae,
eat nectar, pollen, detritus



Syrphid or hover flies

ORDER HYMENOPTERA Wasps, Bees, and Ants

Wasps - four wings (two pairs),
not hairy or few hairs don't carry pollen,
short elbowed antennae, pinched abdomen,
carnivorous diet plus nectar, some feed pollen to young



Yellow jacket (top)
Fig wasp (left)
Paper wasp (right)



Oil-collecting bee

Bees - four wings (two pairs),
pollen carried on branched hair or in baskets
(patches are *scopa*, baskets are *corbicula*),
long elbowed antennae,
like wasps: distinct head, thorax & abdomen,
herbivorous diet of pollen & nectar

Oligolectic: collect pollen of few plant groups
Polylectic: collect pollen of many groups

BEEES OF CENTRAL TEXAS – GENERAL GUIDE

Honey Bees (non-native)

Apis mellifera, *Apidae* Family

Size: medium, **Shape:** robust (worker bees are *apiform*)

Color: amber to black, stripes on abdomen

Hair: fuzz on thorax, under abdomen, on head & eyes

Other: ♀ has flat plate on hind legs to carry moist pollen clump

Behavior: fly & buzz methodically among flowers, polylectic

Nesting: highly social, females build wax honeycombs to nest in large colonies of thousands, with an egg-laying queen



Honeybees

Each cell has a larva (left).
Four wings are visible below.



Head, thorax & segmented abdomen



Corbicula carry moist pollen clumps

[This guide uses descriptive common names based on morphology & behavior]

Bumble Bees

Bombus spp. *Apidae*

Size: medium to very large, **Shape:** robust, bombiform
Color: black with yellow bands, **Hair:** covers entire body
Hair: baskets on hind legs carry moist pollen
Behavior: make low buzzing sound when flying, polylectic
Nesting: social, largely ground nesters



Hairy-legged (digger, miner, chimney, longhorn) *Apidae*

Size: small-medium-large, **Shape:** robust, rounded, euceriform
Color: striped abdomen. **Other:** males may have long antennae
Hair: short, dense, velvety, brush of hair on leg or whole body.
Behavior: fly quickly and smoothly, oligolectic to polylectic
Nesting: solitary to communal ground nesters



Large Carpenter Bees

Xylocopa spp. *Apidae*

Size: very large. **Shape:** robust, bombiform
Color: shiny black/dark blue abdomen
Hair: brush of hair on thorax, hind legs carry pollen
Behavior: territorial males may buzz by you, polylectic
Nesting: solitary cavity nesters, nest in soft wood



Striped Hairy Belly Bee (leafcutter, carders) *Megachilidae*

Size: small to medium, **Shape:** slender to robust, megachiliform
Color: black with silvery hairs, white stripes on abdomen
Hair: brushes on abdomen underside may transport pollen
Behavior: may raise abdomen while visiting flowers, polylectic
Nesting: solitary cavity nesters, may line nest with leaves/hair



Small Carpenter Bees (tiny dark)

Ceratina spp. *Apidae*

Size: tiny. **Shape:** slender, hyaleiform
Color: dark blue-green, metallic, some have white face marks
Hair: hairless except brushes of hair on hind leg carry pollen
Behavior: move fast & jaggedly, polylectic
Nesting: solitary to semi-social, cavity nesters



Metallic Hairy Belly Bee (masons)

Osmia spp. *Megachilidae*

Size: small to medium, **Shape:** stout, rounded, megachiliform
Color: metallic green, blue, or blue-black
Hair: brushes beneath abdomen carry pollen
Behavior: observed in spring-early summer, polylectic
Nesting: solitary gregarious cavity nesters



Green Sweat Bees (metallic green)

Halictidae

Size: medium, **Shape:** slender, andreniform

Color: metallic green, males often with striped abdomen

Hair: females - brush of hair on hind legs carries pollen

Behavior: fast flying, often attracted to sweat, polylectic

Nesting: solitary to social-semi, ground nesters, some in wood



Striped Abdomen (mining) Bees

Andrenidae

Size: tiny to large, **Shape:** medium, andreniform

Color: dark body, gray-striped abdomen

Hair: sparse, concentrated on hind legs

Behavior: oligolectic (Asteraceae, Rosaceae)

Nesting: solitary, ground nesters



Striped Sweat Bees & Tiny Dark Bees

Halictidae

Size: tiny, small, medium, **Shape:** slender, andreniform

Color: dark, shiny metallic, some have abdominal stripes

Hair: brush of hair on hind legs carries pollen

Behavior: crawl in flowers, fast jagged movements, polylectic

Nesting: solitary to semi-social, ground nesters



Striped Abdomen (plasterer) Bees

Colletidae

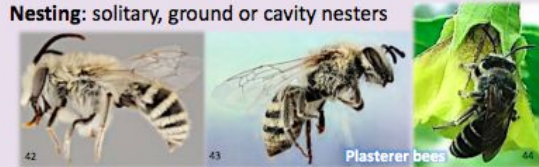
Size: small to large, **Shape:** medium, andreniform

Color: silver-white-striped, may have pointy abdomen

Hair: may have flattened hair on abdomen

Behavior: oligolectic (Asteraceae, Rosaceae, Solanaceae)

Nesting: solitary, ground or cavity nesters



Cuckoo Bees (cleptoparasites)

Coelioxys sp. Megachilidae

Size: small, **Shape:** slender, epeoliform

Color: dark with white abdominal stripes

Hair: sparse thoracic, bare abdomen, lack pollen baskets

Behavior: sip nectar at flowers, don't collect pollen for brood

Nesting: nest in other bees cavities, don't tend to their young



Striped Abdomen (oil-collecting) Bees

Melittidae

Size: small to medium, **Shape:** medium, andreniform

Color: yellow and black striped abdomen

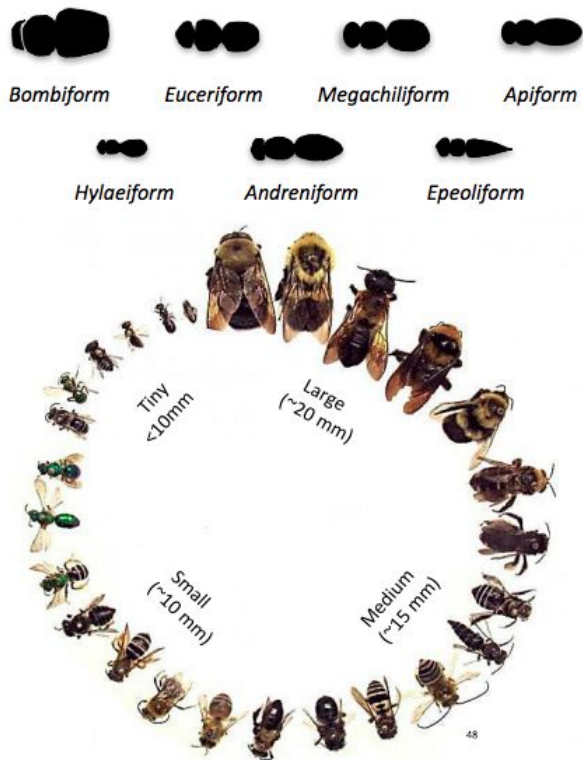
Hair: hairy body carries pollen

Behavior: polylectic, nectar, pollen, and plant oils

Nesting: semi-social, ground or cavity nesters



APPROXIMATE SIZES & SHAPES OF BEES



Photos: 1-2,6, 9-10, 17 Laurel Treviño, 3-4 Commons.wikimedia.org, 5 Sergio Jansen Gonzalez, 7, 45-46 S Urquhart, 8 Max Westby, 11 David Cappaert, 12-13 Charles Schurch Lewallen, 14 Wikimedia.gnu.org, 15, 25 Bob Peterson, 16, 23 Sean McCann, 18 Hadel Go, 19 Steve Nanz, 20 Alain C., 21 Sarah Cusser, 22 Tom Van Devender, 24, 44, 48 T'al H. Raulston, 26 Elizabeth Sellers, 27 Sam Droege, 28 Wikimedia, 29, 38 USGS Native Bee Lab, 30 Andrew Redding, 31 & 40 John Ascher, 32 Jim McCulloch, 33 Sarah Cristopherson, 34 Jerry Friedman, 35 Steve Nanz, 36 Ashley Jacobs, 37 Owen McNamara, 39 Ricardo Ayala, 41 Sankax/flickr, 42 Laurence Packer, 43 Hannah Sutton, 47 Lynette Schimming

BRIEF GUIDELINES FOR BEE SURVEYING

A **census** consists of periodic counts and checklists used to determine the status of bees, and potentially identify valuable plant species or management practices for their conservation. One way to census bees without collecting them is to conduct a standardized observation using Fixed Route Surveys (the preferred method) or Timed Random Walk Surveys. One identifies bees to broad morphological groups (e.g., bumble bee) and counts bees that are actively visiting flowers (hovering or crawling). The observer records the flower species and number of inflorescences, time, and weather. Observations should be done at least twice each season; spring (Mar-May), summer (Jun-Aug) and fall (Sep-Oct); on warm sunny days with little wind, approaching flowers slowly without casting shadows that disturb the bees.

Fixed Route Surveys require a standardized area (e.g., 50m X 2m) observed for a standardized time (e.g., 30 minutes). Within this area, five 1m X 1m plots are additionally surveyed for plant species and inflorescence number. **Timed Random Walk Surveys** require walking randomly with a steady pace and stopping periodically to observe and record the bees visiting flowers.

The *Xerces Society for Invertebrate Conservation* Bee Monitoring Protocol can be used for a more systematic observation of bee communities. Please refer to our website for details.

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<http://w3.biosci.utexas.edu/jha>



The University of Texas at Austin

Texas Parks & Wildlife Department

https://tpwd.texas.gov/publications/pwdpubs/media/pwd_bk_w7000_1813.pdf
https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/nongame/native-pollinators/native-bee-needs.html

The *Xerces Society* <http://www.xerces.org/pollinator-conservation>
USFS/USDA http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5306468.pdf

Winkler
Family
Foundation



Bumble Bees *(Apidae)*

Size: medium to very large

Shape: robust

Color: black with yellow bands

Hair: covers entire body

How I Remember: BB (Big Bee),
Bumbling Nature, Classic Black
& Yellow



"October Bumble Bee" by MattX27

Bumble Bees (*Apidae*)

Nesting: social, ground
Nesters

male



worker



queen



common eastern bumble bee
Bombus impatiens



By Alex Suroicã

Digital Museum of Natural History

newly emerged worker



Bumble Bees *(Apidae)*

Behavior: buzzing sound when flying

Fun fact: they often shake flowers to release pollen

“Scent markings” to detect & avoid flowers

Large flowers



Tiny Sweat Bees (*Halictidae*)

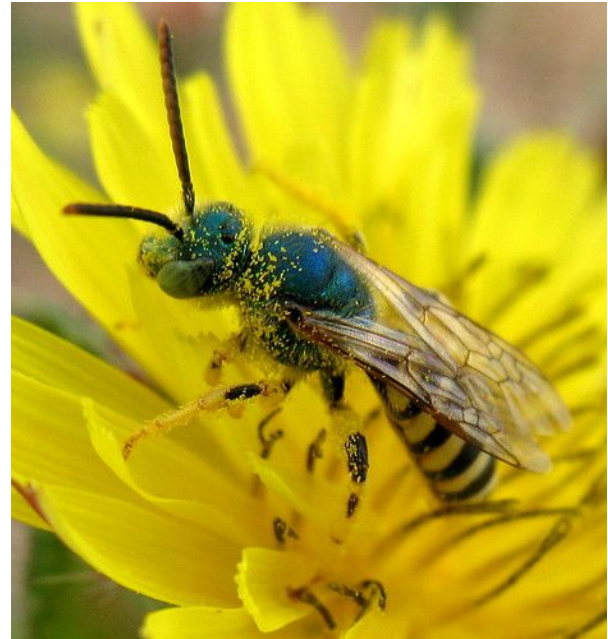
Size: tiny, small, medium

Shape: slender

Color: dark, shiny metallic,
some have abdominal stripes

Hair: brush of hair on hind legs
for pollen

How I Remember: Little guys
that like sweat



"Agapostemon sp. sweat bee" by K Schneider

Tiny Sweat Bees (*Halictidae*)

Nesting: solitary, ground nesters

Prefer bare ground

No mulch



Tiny Sweat Bees (*Halictidae*)

Behavior: Fast, jagged movements

Fun facts: They lick sweat for salt

Can sting

Smaller flowers



Long-horned Bees (*Apidae*)

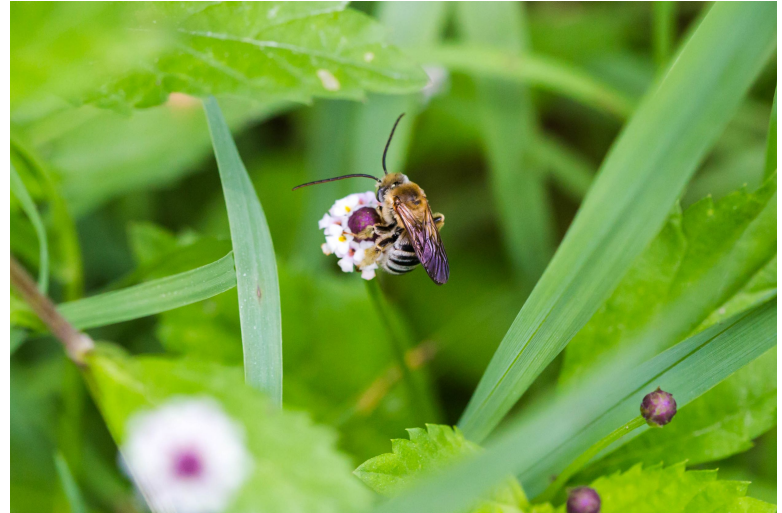
Size: small-medium-large

Shape: robust, rounded

Color: striped abdomen

Hair: short, dense, velvety, brush on hair on leg

How I Remember: Hairy, tough, burly bees (Digger, Miner, Longhorn--tough names)



Long-horned Beeby Melissa McMasters

Long-horned Bees (*Apidae*)

Nesting: solitary to communal
ground nesters

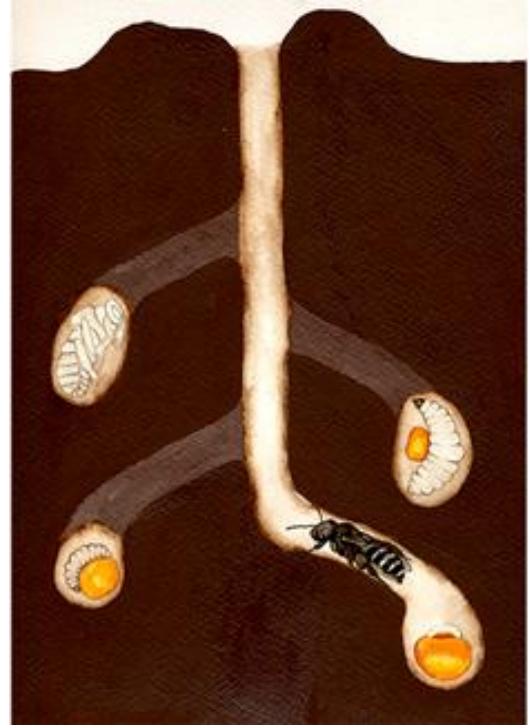


Illustration by Sarina Jepsen

Long-horned Bees (*Apidae*)

Behavior: fly quickly & smoothly

Fun fact: Only males have
“Longhorns”

Hairy-legged

Sunflower family

Males sleep outside



Large Carpenter Bees (*Apidae*)

Size: very large

Shape: robust

Color: shiny black/dark blue abdomen

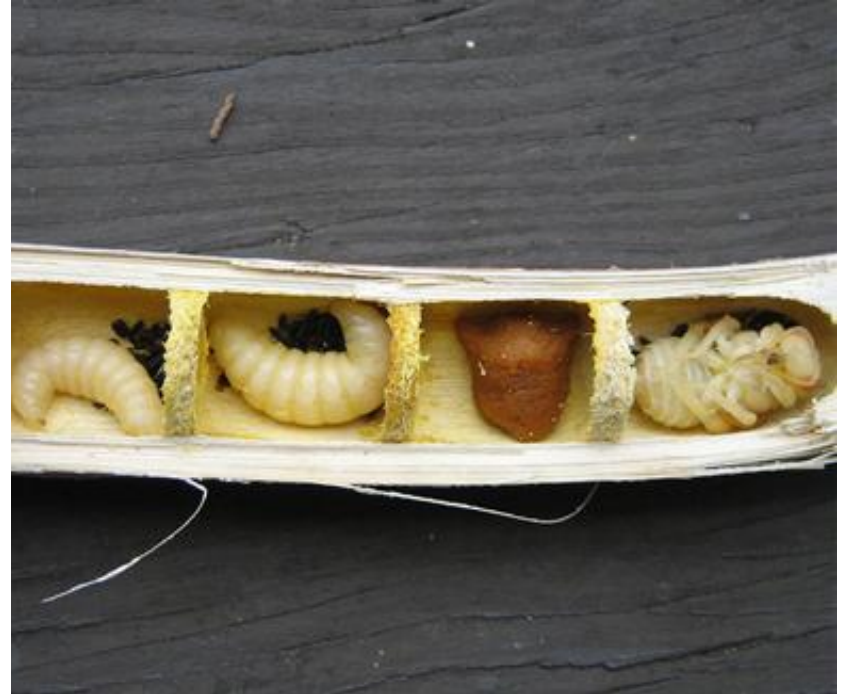
Hair: brush of hair on thorax

How I Remember: Shiny hiny--shiny like a hammer



Large Carpenter Bees (*Apidae*)

Nesting: solitary, nest in soft wood that they drill



Large Carpenter Bees (*Apidae*)

Behavior: territorial males may buzz

Fun fact: Reuse wood particles to build cells

Will bite flower at its base to get nectar

Large flowers



Small Carpenter Bees (*Apidae*)

Size: tiny

Shape: slender

Color: dark blue-green, metallic

Hair: hairless except for hind legs

Behavior: move fast & jaggedly

Nesting: solitary to semi-social, cavity nesters

How I Remember: Tiny shiny hammers



Hadel Go

Green Sweat Bees (*Halictidae*)

Size: medium

Shape: slender

Color: metallic green, males with striped abdomen

Hair: females brush of hair on hind legs

How I Remember: They're metallic green



"IMG_7592 Green Sweat Bee" by popo.uw23

Green Sweat Bees (*Halictidae*)

Behavior: fast flying, attracted to sweat

Nesting: solitary to semi-social, ground nesters

Fun fact: Sunflower family

Bare ground



Leafcutter Bees (*Megachilidae*)

Size: small to medium

Shape: slender to robust

Color: black with silvery hairs, white stripes on abdomen

Hair: covers entire body

How I Remember: cigar shaped bee with hairy abdomen



"Before" by bramblejungle

Leafcutter Bees (*Megachilidae*)

Nesting: solitary cavity nesters, may line nest with leaves



Craig Couden, 2014

Leafcutter Bees (*Megachilidae*)

Behavior: may raise abdomen while visiting flowers

Fun fact: carries pollen on belly rather than legs

Prefers roses



Mason Bees (*Megachilidae*)

Size: small to medium

Shape: stout, rounded

Color: metallic green, blue or blue-black

Hair: brushes beneath abdomen carry pollen

How I remember: Mas**O**n, rounded shape



"2 Osmia rufas at work" by Nigel Jones

Mason Bees (*Megachilidae*)

Size: small to medium

Shape: stout, rounded

Color: metallic green, blue or blue-black

Hair: brushes beneath abdomen carry pollen

How I remember: MasOn, rounded shape, shiny mason trowel



Mason Bees (*Megachilidae*)

Nesting: solitary cavity

Nesters

Use “mud” to line cells



USDA Agricultural Research Service

Mason Bees *(Megachilidae)*

Behavior: observed in
spring-early summer

Fun fact: Also known as an
orchard bee because of its
pollinating habits



Mining Bees (*Andrenidae*)

Size: tiny to large

Shape: medium

Color: dark body, gray-striped abdomen

Hair: sparse, on hind legs

How I remember: A “mining bee” needs a gray belt



"Mining Bee" by Friends of Radley Lakes

Mining Bees (*Andrenidae*)

Behavior: preference for certain pollens

Nesting: solitary, ground nesters

Fun fact: prefer building nests in sunny, bare soil



Plasterer Bees *(Colletidae)*

Size: small to large

Shape: medium

Color: silver-white-striped

Hair: flattened hair on
Abdomen

How I remember: The hair is
“plastered” on its abdomen



Plasterer Bees *(Colletidae)*

Behavior: collect pollen from only a few plants

Nesting: social, ground or cavity nesters

Fun fact: also known as polyester bees and cellophane bees because of the silky substance they secrete and use to line their nests



Honey Bee Basics

- Identifying Characteristics
- Inside a Hive



Honey Bee History

-Introduced to the
New World by
Europeans in the
1600s

-Non-native



Honey Bee *(Apidae)*

Size: medium to large

Shape: robust

Color: amber to black, stripes on abdomen

Hair: fuzz on thorax, under abdomen, on head & eyes



Honey Bee *(Apidae)*

Behavior: buzz methodically among flowers

Nesting: social insects, superorganism, egg-laying queen, can be feral or managed

We're looking at managed bees today



Inside a Hive: Queen

- In a managed hive, queens are mated
- In a feral hive, queens will leave on mating flights and return
- Queen larva fed a nutrient-rich royal jelly
- Can lay up to 2,000 eggs in a day
- Can live up to 5 years







Inside a Hive: Worker Bees

- Largest population in the hive
- All female
- Has different responsibilities and specific jobs
- Live about 6 weeks



Inside a Hive: Worker Bees

-Cleaner bees

-Nurse bees

-Pollen packers

-Queen assistants

-Fanners

-Undertaker

-Scout bees

-Guard bees

-Foragers



Inside a Hive: Drones

- Only males in the hive
- Several hundred
- Only job is to mate with new queens
- Live about 12 weeks





Attracting Bees

- Providing Habitat
- Flower Gardens



Ground-Nesting Area

- Grounds may vary according to bees (hard-packed soil, loose, bare, lawns, etc.)
- Garden pathways close to gardens
- Sand pits: Dig 2 foot hole, 2-3 ft. in diameter, and fill with well-drained soil



Bumble Bee Nests

- Find plans online
- Use untreated wood
- Be patient, may take up to a year



Bee Block

- Untreated wood
- Drill a variety of sized holes ($\frac{1}{4}$ inch to $\frac{1}{2}$ inch in diameter and $1 \frac{1}{2}$ inches to 3 inches in depth)
- Put a roof to keep out rain
- Face south or southeast



Bee Nest Bundle

- Instead of drilling, provide premade tunnels in twigs
- Tie bundles of hollow stems and sticks together
- Stems should be 6-9 inches in length and one end should be closed



Premade Bee Houses

A variety of premade houses and plans can also be found online



Flower Gardens

- Contact your local nursery and replace non-native plants with native plants. It's what the bees want.
- Visit gardens, contact native plant groups
- Avoid chemicals in your garden



Flower Gardens

- Choose a variety of flowers (colors, shapes, sizes)
- Plant flowers in clumps
- Plant for different seasons
- Provide shallow “bee ponds”



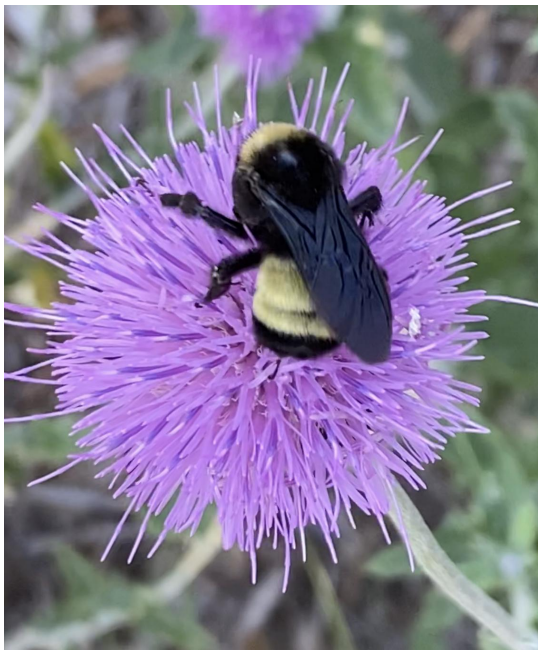
Hardberger Park Wildscape Demonstration Garden



Hardberger Park Wildscape Demonstration Garden



Hardberger Park Wildscape Demonstration Garden



Identifying Bees

Questions?



—

Beekeeping Basics



Beekeeping Basics: Equipment

- Complete Hive Box
- Protective Suit & Gloves
- Hive Tool
- Smoker
- Opportunities for learning



Beekeeping Basics: Challenges

- *Varroa* mite is the most destructive parasite of honey bees



Beekeeping Basics: What We've Learned

- Importance of educating yourself & seeking mentors
- It's a commitment, but rewarding
- Bees depend on you

