Native Bee Watch

A Colorado Citizen Science Field Guide

Lisa Mason, Boris Kondratieff, Arathi H. S.
Colorado State University

Adapted from the Xerces Society's California Pollinator Project: Citizen Science Pollinator Monitoring Guide, 2010, by Katharina Ullmann, Mace Vaughan, Claire Kremen, Tiffany Shih, and Matthew Shepherd.

COLLEGE OF AGRICULTURAL SCIENCES
COLORADO STATE UNIVERSITY

BIOAGRICULTURAL SCIENCES & PEST MANAGEMENT DEPARTMENT

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Thank you for participating in this project! We greatly appreciate your contribution to research and helping Fort Collins become a bee-friendly community. We hope you learn a lot, meet new friends, and have fun this summer!

For more information, visit: NativeBeeWatch.WordPress.com

Contact Information

Lisa Mason
Colorado State University
Bioagricultural Sciences and Pest Management Department
Lisa.Mason@colostate.edu
(303) 829-0433

Dr. Arathi Seshadri
Colorado State University
Soil and Crop Sciences Department
Arathi.Seshadri@colostate.edu
(970) 491-6804

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Why Are Bees Important? About the Project

All bees are important pollinators and not just honey bees! They provide ecosystems services or benefits to humans. Pollinators benefit humans by providing 1/3rd of our food including fruits, vegetables, and nuts—the most nutritious part of our diet.

Pollinators are critical for ecosystem and human health, but their populations are declining due to many reasons including:

- Habitat and nutrition loss due to urbanization and monocropping
- Parasites and disease
- Pesticide and chemical use
- Climate change

It is often a variety of interactions between these factors that contributes to population declines. Specifically, this project is looking at urbanization and how it affects the biodiversity and abundance of bees.

Did You Know?

- 75% of more than 240,000 plant species rely on pollinators for reproduction!
- The global production of crops that depend on pollinators is an industry worth up to US $577 billion annually
- Bees help to pollinate 1/3rd of the human diet
- They pollinate over 70 crops
- In addition to crops, they pollinate the food for livestock that contributes to the meat and dairy industry

In North America, 82% of the human population lives in urban areas, and this percentage is expected to increase. Urbanization leads to the loss of wild and natural spaces. Changes to the landscape can destroy, degrade, or fragment critical habitat. However, many of the solitary, native bees have small foraging areas. Urban areas can also have a high diversity of flowering plants. Could these urbanized areas with high flowering diversity benefit wild bee populations?

Photo: Lisa Mason

Figure 1. A honey bee pollinating a Red Rocks® penstemon.

Some research has been done in the United States and Europe, but we need more targeted research studies to understand how urban areas can support bee diversity.

This is why we need your help! We are collecting baseline biodiversity and abundance data on what bee species currently live in the area. The data collected will provide information not only on the biodiversity and abundance, but also on what factors could be positively or negatively affecting the bees in urban areas. This ultimately will lead to recommendations for urban/city planners and homeowners on how we can enhance bee habitats!

Photo: Lisa Mason

Figure 2. Volunteers monitor bees at the Plant Select garden in the CSU's Flower Trial Gardens.

Did You Know?

- There are an estimated 20,000 bee species worldwide
- There are over 4,000 bee species in North America
- There are over 900 species in Colorado
- 437 bee species have been recorded in Larimer County
- Bees rely on pollen or nectar for their entire life cycle

Volunteer Responsibilities

Volunteer Requirements

To participate in the program, volunteers are required to:

- Be at least 18 years old
- Attend a training session
- Commit to attending four bee monitoring sessions that will last about two hours each
- Have a strong interest in learning about bees, plants and urban ecosystems

Check NativeBeeWatch.WordPress.com for information on how to get involved and attend a training workshop.

No previous bee identification experience is needed. All skills will be taught at the training workshop and in the field with a researcher.

Photo: Victoria Halligan

Figure 3. CSU student, Colton O'Brien teaches volunteers how to identify bees using illustrations and actual specimens.

Methods in this field guide were created to be used in Fort Collins, but can be implemented in any area in Colorado.

Field Preparation

Photo: Lisa Mason

Figure 4. A citizen scientist monitors bees at the Gardens on Spring Creek in Fort Collins, Colorado.

Since you will be working outside, you need to be prepared for a variety of conditions. In this chapter, we explain what you'll need to wear, bring, and know to conduct your surveys comfortably and safely. The City of Fort Collins Nature in the City Initiative provides the following recommendations:

What to wear

- **Hiking boots or tennis shoes** – Good footwear is essential, especially when you are walking off trail through vegetation to access the sampling point.
- **Long pants** – We recommend that you wear long pants to protect your legs from vegetation and insects as you walk to the sampling point.
- **Jacket or sweatshirt** – Early mornings can be chilly. Make sure you have a jacket or sweatshirt to protect against the cold. Layers are important.
- **Hat and/or sunglasses** – Be sure to protect your face and eyes: summers can be bright and hot.
- **Sunscreen** – Be sure to use plenty of sun protection to avoid getting burned.
- **Mosquito repellent** – You may also want to wear insect repellent to avoid mosquito bites.

What to bring

- **Backpack** – Carry your data sheets, field guides/ID booklets, maps, and other field gear.
- **Water bottle** – Carry plenty of drinking water to keep from getting dehydrated as you conduct your surveys.
- **Data sheets and instructions** – Bring extra copies of the data sheets in case one gets lost or damaged.
- **Timepiece** – Bring a watch or phone to time yourself while you conduct surveys.
- **Pencil** – Bring extra pencils; they tend to get lost easily.
- **Field guide** – Bring this field guide and other field guides to help identify species that you see.

Safety in the field

You should always feel safe and comfortable as you conduct your surveys. When you go out on a sampling session, always let one of the researchers, a friend and/or family member know where and how long you expect to be in the field. Bring a cell phone so you can contact others if you need. Always be aware of your surroundings. Never approach wild animals, especially if they seem to be acting strangely. Check the weather before you go out. Don't work in adverse weather conditions – bees aren't out while it's raining, so you shouldn't be either!

If you have allergies or other medical conditions that might require that you take medication, bring your medications with you.

We would never want you to do anything that is beyond your comfort level. Don't conduct your survey if you don't feel safe! If you feel concerned about field conditions during any time, please tell the researcher.

About Flowers

Only record data of a bee visiting the reproductive parts of a flower. If the bee is on the reproductive part of the plant, it is probably collecting pollen or nectar. You may not be able to see the reproductive parts of the flower, but the bee should be inside the flower. You may see pollen grains on the body of the bee. If the bees are flying or on other parts of the flower such as leaves, stems, or petals, they may not be pollinating.

Pollinating a Flower

Photo: Lisa Mason

Not Pollinating

Photo: Lisa Mason

Figure 5. Bees are pollinating flowers only when they are visiting the reproductive flower parts. If the bee is on the petals, leaves, or stem, the bee is not pollinating.

Reproductive Parts of a Flower

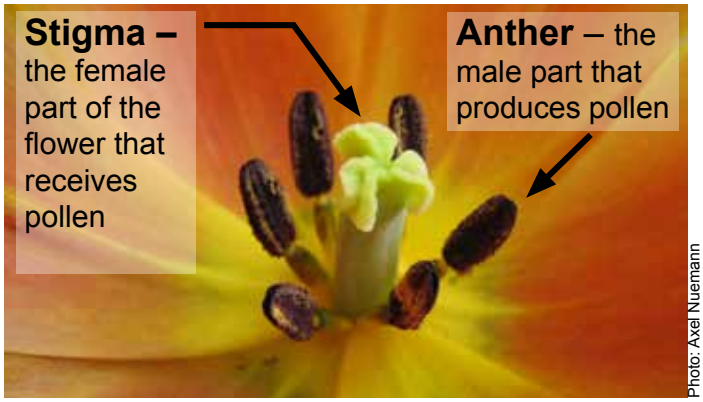


Photo: Axel Nuemann

Figure 6. Bees are pollinating flowers only when they are visiting the reproductive flower parts. Look inside a flower to see the anthers and the stigma. Note the pollen on the anthers. That pollen needs to be transferred to another flower of the same species or the same plant.

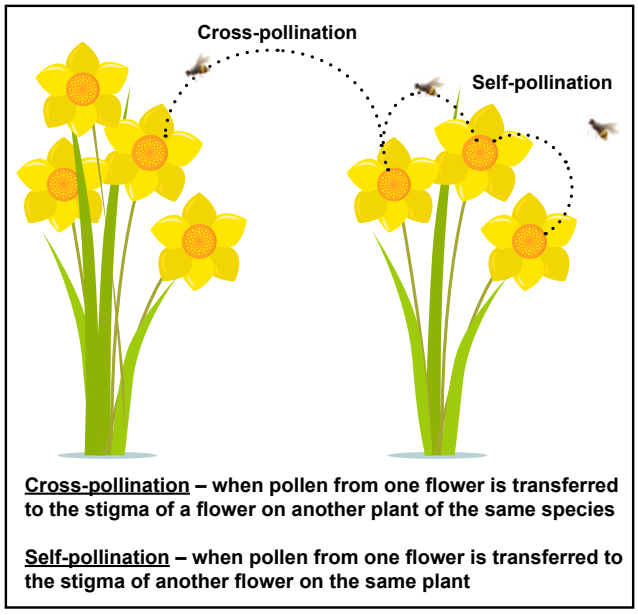


Figure 7. Cross-pollination versus self-pollination.

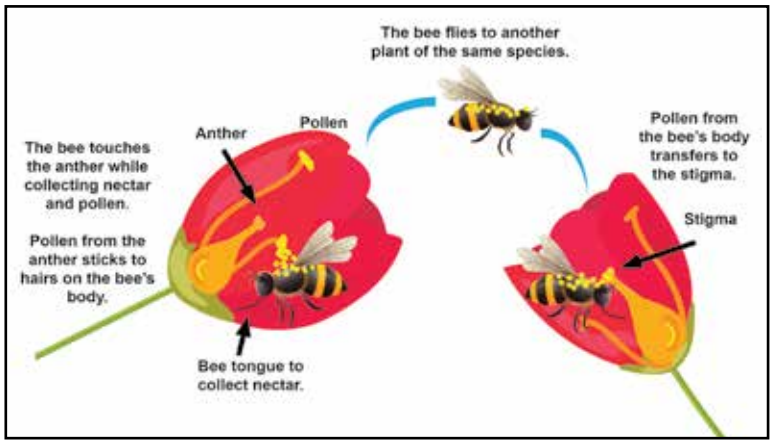


Figure 8. Pollen transfer by bees.

Tips for Observing Bees on Flowers

- Choose a small observation area where you can focus on and record everything. Observe a small area and collect accurate data rather than a large area where bee observations could be missed.
- Observe all flowers, small and large, along the defined transect. Include invasive plant species such as bindweed, which produces trumpet-shaped flowers that bees visit.
- Look closely inside flowers, but be careful to not disturb bees or other insects visiting the flowers by standing too close or making quick movements.
- Be aware of your shadow – a shadow that is in front of you and covers the flower may disturb the bees.
- Consistency is important throughout observing and collecting data.

About Bees

Bees are a fascinating group of insects! Most people are familiar with the non-native European honey bee, *Apis mellifera*. The European honey bee was introduced to North America in 1622. They are one of the few truly social species of bees in world that are known as eusocial bees (see page 10). Most native species of bees are solitary and build nests underground or in cavities. Some bee species are primitively eusocial meaning they share characteristics of eusocial and solitary bees.

Solitary Bees

Of all the diverse bee species, about 90% of them are solitary. Of those bees, about 70% live underground and the other 30% are cavity nesters. During the life cycle, a female bee builds a nest underground or in a cavity. She will collect pollen and nectar to bring back to the nest. All the collected pollen and nectar is made into a ball called "bee bread" which will be all the food needed for one growing bee. The female lays an egg on the bee bread and seals up the nest. After the egg hatches, the larva will go through full metamorphosis from a larva, then a pupa to an adult before emerging from the nest. Solitary bees live for one season and do not interact with any other bees of the same species except briefly for mating.

Photo: MaLisa Spring

Figure 9. A larva on top of a ball of pollen and nectar called "bee bread".

Photo: MaLisa Spring

Figure 10. A developing pupa.

Photo: MaLisa Spring

Figure 11. An adult bee emerging from the nest.

Some solitary bees share a communal colony and are known as parasocial bees. Many females of the same generation use the same nest, but individuals create their own cell within the communal nest. They practice mutual tolerance; they do not interact with each other or share social bee behaviors. Green metallic sweat bees (*Agapostemon* spp.) are an example of a bee that share communal nests.

Underground Nesters

Figure 12. A solitary bee in the Colletidae family emerging from her underground nest.

Cavity Nesters

Figure 13. A human-made bee home for cavity-nesting bees.

Figure 14. Underground solitary bee nests.

Figure 15. A *Ceratina* sp. in a cavity nest.

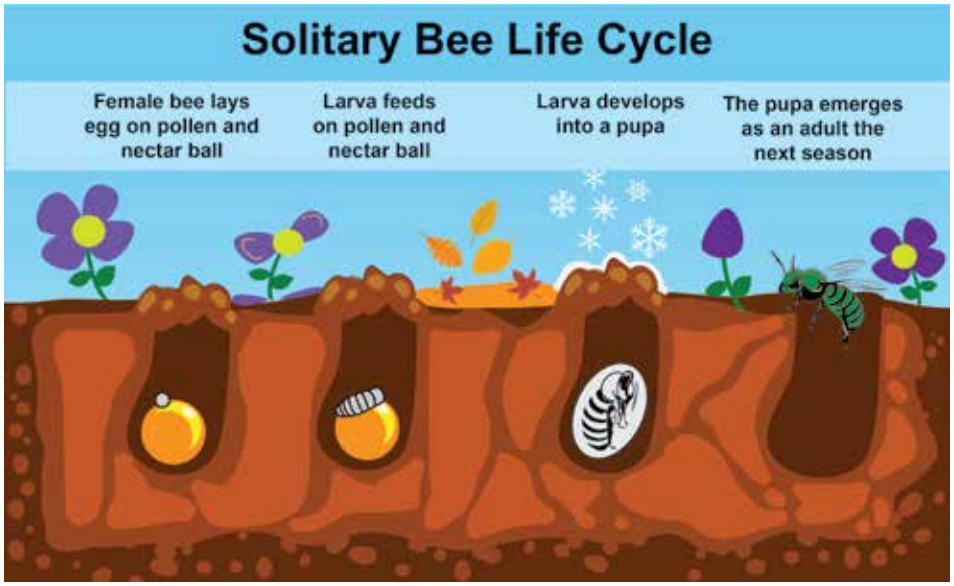


Figure 16. Solitary bee life cycle.

Eusocial Bees

Eusocial bees, such as the European honey bee (*Apis mellifera),* live together in groups with one queen, female worker bees, and seasonally produced male drone bees. Honey bees live in manmade hives. Feral honey bee colonies occur in the wild inside natural hollow spaces such as tree trunks. Unlike solitary bees that live only one season, honey bees live through the winter. A colony may have 20,000 to 80,000 worker bees and hundreds of drones.

The three main characteristics of eusocial insects are: (1) overlapping generations, (2) cooperative brood care, and (3) reproductive division of labor. Overlapping generations occur when younger and older generations work in a colony at the same time. Honey bees are often tasked to do different jobs depending on their age, known as age polyethism. For example, a young bee up to 11 days old will secrete brood food. A middle-aged bee from 11 - 21 days old will secrete beeswax. An older bee over 21 days can have a variety of jobs including forager, storer, or undertaker. Brood care is a task allocation given to younger bees. Queens are the only ones who reproduce in the colony, establishing the reproductive division of labor. Workers are responsible for feeding the larvae, constructing and cleaning the nest, foraging for food, and defending the nest.

Photo: Lisa Mason

Figure 17. The honey bee, a eusocial bee.

Photo: Jessica Louque, Smithers Viscient, Bugwood.org

Figure 18. A queen honey bee is larger than the worker bees.

Photo: Lisa Mason

Figure 19. Arathi Seshadri checking the frames in a new hive at CSU's Agricultural Research, Development and Education Center.

Photo: Tara Costanzo

Figure 20. A bee swarm on a juniper tree. Swarming is when a group of bees leave the current colony to start a new colony.

Primitively Eusocial Bees

Some bees such as bumble bees (*Bombus* spp.) have both eusocial and solitary characteristics and are known as primitively eusocial bees. Bumble bees live underground or in cavities and have a one-year life cycle like a solitary bee. Within the season, a colony will develop. A queen will find a place to nest and hibernate over the winter. When spring arrives, she will emerge, begin to forage, build a new nest, and lay eggs. The eggs will mostly be female worker bees. The queen will continue to lay eggs throughout the season. In late summer, a few new queens and male bumble bees will hatch and leave the colony. The new queens will mate with male bumble bees and then hibernate through the winter. Queen bumble bees are more aggressive and capable of living alone, unlike honey bee queens. Most primitively eusocial bees store food in the brood cell for the larva to feed on. Bumble bees are an exception and store food outside brood cells, a characteristic of eusocial bees.

Photo: MaLisa Spring

Figure 21. A bumble bee emerging from her nest.

Photo: MaLisa Spring

Figure 22. A commercial bumble bee nest.

What Do Bees Feed On?

All bees feed on pollen and nectar. Most of the bees in this field guide are polylectic, meaning they collect pollen and nectar from a variety of flower species. These bees are opportunistic but still may prefer certain flowers. A monolectic bee only feeds on a specific plant species. Monolectic bees have generally coevolved with a specific plant species meaning the plant and bee depend on each other for survival.

Tips for Identifying Bees

Identifying bees is a challenge. Hundreds of bee species exist, especially in the western United States, that scientists can only identify to the genus level because of the uncertainty with species identification. You do not want to assume or guess an identification. If you are not confident which type of bee it is, note if it is a honey bee, native bee, fly, wasp, or other pollinator.

Weather Conditions and Time of Year

Note the weather conditions because this will directly affect bee activity. Bees will not be active in windy, cold, or cloudy weather. Bees are the most active in the mornings which is why sampling will occur between 9am-11am. Check the weather temperature and forecast before observing bees. We will provide protocols on how to determine if cloud cover or wind will affect the sampling session.

Different species of bees will be more active in different parts of the year. Different plants also bloom at different times of the year.

Bee Characteristics

- **Four wings -** two pairs, sometimes difficult to see, hind wings are often small
- **Hair -** most have hairy bodies for carrying pollen
- **Eyes -** large, well-separated on top of head
- **Antennae -** long, segmented, and often bent
- **Corbiculae -** many bees have flattened plates used as pollen baskets on hind legs
- **Scopa -** Pollen-carrying hairs on hind legs or abdomen, often covered with pollen
- **Body Shape -** rounder bodies than wasps and flies
- **Size -** 2 to 25 mm (less than 1/8th inch to 1 inch) or more
- **Body Color -** Can be black, brown, orange, yellow, red, metallic blue or green, or copper-colored
- **Stripes -** Body color (exoskeleton) or hair colors (yellow, orange, white, black, or brown) can form stripes

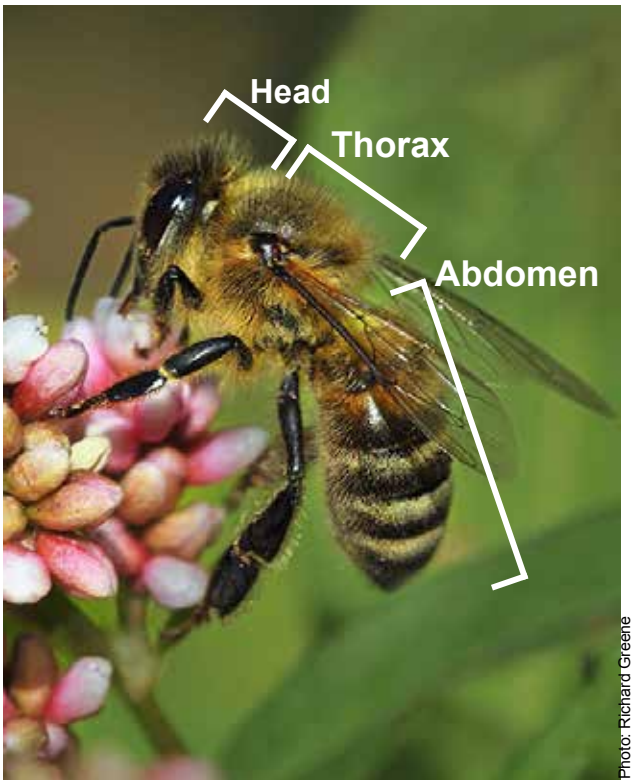


Figure 23. Important identification characteristics of a bee. Can you spot some of the major characteristics?

Figure 24. Note the four wings.

Figure 25. Hairs on the thorax of a bumble bee.

Figure 26. Note the bent antennae on a *Ceratina* sp.

Figure 27. A pollen basket on a bumble bee.

Figure 28. The flattened plate of a hind leg on a honey bee.

Figure 29. Note the large compound eye on the side of the honey bee's head.

Identification

Non-Bee Pollinators, Common Flower Visitors

Photo: Bob Parks

Figure 30. Ants. (Example: *Formica* sp.)

Photo: Lisa Mason

Figure 31. Beetles. (Example: Red or milkweed longhorn beetle)

Photo: Lisa Mason

Figure 32. Birds. (Example: Hummingbird)

Photo: Lisa Mason

Figure 33. Butterflies. (Example: Two-tailed swallowtail)

Photo: Micaela Truslove

Figure 34. Flies. (Example: Syrphid or flower flies)

Photo: Whitney Cranshaw, Colorado State University, Bugwood.org

Figure 35. Moths. (Example: Army cutworm moth)

Photo: Lisa Mason

Figure 36. Wasps. (Example: European paper wasp)

Photo: Robert Schorr, Colorado Natural Heritage Program

Figure 37. Bats. (Example: Townsend's big-eared bat)

Flies Versus Bees

Flies can often be confused with bees because some look very similar and often mimic bees.

Common characteristics that differentiate flies from bees include:

- Two (one pair) of flying wings
- Short, thick antennae, usually three segments (bees usually have 10-11 segments)
- Large eyes near the front of their head
- Usually not hairy (there are exceptions)
- Flies can hover (most bees cannot)
- Flies do not carry pollen loads

Syrphidae - Flower, Syrphid, or Hover Flies

Photo: Micaela Truslove

Figure 38. Flower flies are often flower visitors. This group of flower flies are called "drone" flies, supposedly mimicking male honey bees known as drones.

Photo: Lisa Mason

Figure 40. A common flower fly that feeds on nectar, pollen, and honeydew secreted by aphids.

Photo: Lisa Mason

Figure 39. A flower fly that mimics a bumble bee. Note the short antennae.

Bombylidae - Bee Flies

Photo: Bob Parks

Figure 41. *Bombylius* sp. near the Cache la Poudre River.

Wasps Versus Bees

Bees can also be confused with wasps because some species of wasps look very similar to bees.

Common characteristics that differentiate wasps from bees include:

- Not distinctly hairy
- Two pairs (four wings), often longer than bees
- Many have a pinched abdomen known as a “wasp waist”
- Narrower bodies
- Often distinct black, yellow, or white color patterns on the exoskeleton
- Do not carry pollen loads

Pseudomasaris - Pollen or Masarid Wasp

Photo: Granite Ridge Nature Institute, Lynn & Gene Monroe

Figure 42. This wasp is a well-known pollinator of violet-colored penstemon or phacelia flowers.

Polistes dominula - European Paper Wasp

Photo: David Cappaert, Bugwood.org

Figure 43. Note the pinched abdomen known as a “wasp waist”. This wasp is the common paper wasp in the area.

Sceliphron caementarium - Black and Yellow Mud Dauber

Photo: Lisa Mason

Figure 44. Note the pinched abdomen known as a “wasp waist”.

Types of Bees

Photo: Lisa Mason

Figure 45. Honey bees.

Photo: Micaela Truslove

Figure 46. Bumble bees.

Photo: Susan Ellis, Bugwood.org

Figure 47. Green metallic sweat bees.

Photo: Richard Greene

Figure 48. Hairy belly bees.

Photo: Lisa Mason

Figure 49. Striped sweat bees.

Photo: MaLisa Spring

Figure 50. Tiny dark bees.

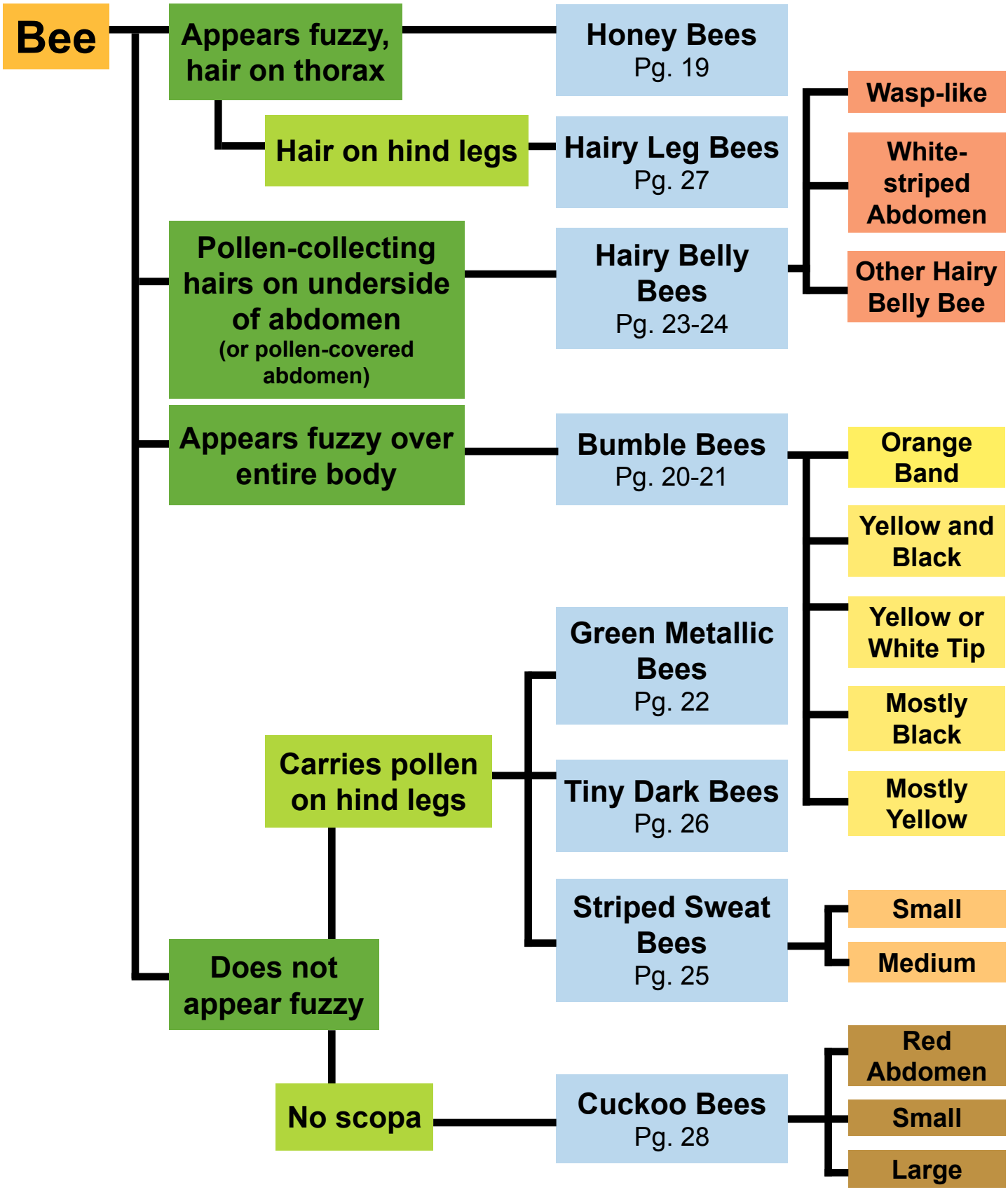
Photo: Lisa Mason

Figure 51. Hairy leg bees.

Photo: Whitney Cranshaw, Colorado State University, Bugwood.org

Figure 52. Cuckoo bees.

Key to Identifying Bees



Bee Groups and Scientific Classification

Bee Group	Bee Subgroup	Common Name	Scientific Name	Family
Honey bee	NA	Honey bee	*Apis mellifera*	Apidae
Hairy leg bee	NA	Digger bee Flower bee Long-horned bee Sunflower bee	*Anthophora* sp. *Diadasia* sp. *Melissodes* sp. *Svastra* sp.	Apidae Apidae Apidae Apidae
Hairy belly bee	Wasp-like	Wool carder bee Resin bee	*Anthidium* sp. *Megachile* sp.	Megachilidae Megachilidae
	White-striped	Leafcutter bee	*Megachile* sp.	Megachilidae
	Other hairy belly bees	Mason bee	*Megachile* sp. *Osmia* sp. *Hoplitis* sp.	Megachilidae Megachilidae Megachilidae
Bumble bee	Orange band	Hunt's bumble bee Central bumble bee	*Bombus huntii* *Bombus centralis*	Apidae Apidae
	Yellow and black	Brown belted bumble bee Morrison's bumble bee Nevada bumble bee	*Bombus griseocollis* *Bombus morrisoni* *Bombus nevadensis*	Apidae Apidae Apidae
	White or yellow tip	Western bumble bee	*Bombus occidentalis*	Apidae
	Mostly black	Cuckoo bumble bee	*Bombus insularis*	Apidae
	Mostly yellow	Golden northern bumble bee	*Bombus fervidus*	Apidae
Green metallic bee	NA	Sweat bee	*Agapostemon* sp. *Augochlorella* sp.	Halictidae Halictidae
Tiny dark bee	NA	Small carpenter bee Small carpenter bee Yellow-faced bee	*Ceratina neomexicanum* *Ceratina* sp. *Hylaeus* sp. *Lasioglossum* sp.	Apidae Apidae Colletidae Halictidae
Striped sweat bee	Small	Sweat bee Sweat bee, other	*Halictus* sp. *Lasioglossum* sp.	Halictidae Halictidae
	Medium	Sweat bee Sweat bee, other	*Halictus* sp. *Lasioglossum* sp.	Halictidae Halictidae
Cuckoo bee	Red abdomen	Cuckoo bee Cuckoo bee	*Nomada* sp. *Sphecodes* sp.	Apidae Halictidae
	Small	Cuckoo bee Cuckoo bee Cuckoo bee	*Epeolus* sp. *Nomada* sp. *Sphecodes* sp.	Apidae Apidae Halictidae
	Large	Cuckoo bee Cuckoo bee Cuckoo bee	*Epeolus* sp. *Nomada* sp. *Sphecodes* sp.	Apidae Apidae Halictidae

Note: This is not an inclusive list of all bees found in these categories or in Colorado. These are some of the more common bees observed.

Honey Bees

- Size: Medium to large
- Color: Orange-brown with black stripes on abdomen
- Legs: Enlarged, flattened plates used as pollen baskets on hind legs
- Carries moist pollen in clumps on hind legs
- Fuzzy thorax
- Flies methodically from flower to flower
- Makes a buzzing sound when flying
- Polylectic

Note: When monitoring, be sure to differentiate between honey bees and other native bees, even if you cannot identify the native bee to type.

Figure 53. A fuzzy thorax is the first characteristic to look for when using identification key.

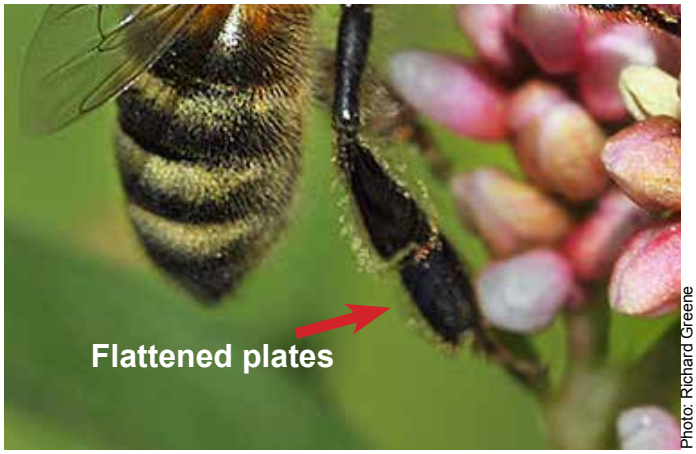


Figure 54. Large, flattened plates on the hind legs are used as pollen baskets.

Figure 55. Note the corbiculae, pollen baskets.

Honey Bee Color Variations

Figure 56. Note the darker shades on the honey bee's body.

Figure 57. Note the lighter color orange shade on the honey bee's body.

Bumble Bees

- Size: Medium to very large, often workers or specific species vary in size
- Color: black with yellow stripes (sometimes rust or gray stripes)
- Legs: Flattened plates on upper hind legs for carrying pollen called corbiculae
- Rounded body shape
- Entire body is fuzzy
- Makes a low buzzing sound when flying
- Parasitic bumble bees, known as cuckoo bumble bees (*Bombus* sp.), look like bumble bees but do not have corbiculae, are less hairy with harder bodies
- Polylectic

This key is for female bumble bees and only for the very common species along the Front Range in Larimer County. Variations in color exist within each species and between the different species, and these are general guidelines. Remember: If you cannot identify which bumble bee group your bee falls into, please note that as a bumble bee only. Feel free to write down other details in the "Additional Observations" section.

Orange Band Bumble Bees

- Orange band on abdomen
- Yellow thorax with black band
- Species include: *Bombus huntii* and *Bombus centralis*

Photo: Lisa Mason

Figure 58. *Bombus huntii,* a common bumble bee species.

Photo: Diane Wilson

Figure 59. *Bombus centralis*, Central bumble bee.

Yellow and Black Bumble Bees

- Black and yellow abdomens with variation within species and between species
- Thorax can be both black and yellow also with variation
- Species include: *Bombus nevadensis, Bombus morrisoni,* and *Bombus griseocollis*

Photo: Diane Wilson

Figure 60. *Bombus nevadensis.*

Photo: Diane Wilson

Figure 61. *Bombus griseocollis.*

Did You Know?

- Bumble bees "buzz pollinate" flowers which means they produce vibrations to shake the flower. The anther (male flower part holding the pollen) will then release the pollen. Tomatoes and blueberries are great examples of plants that require buzz pollination to properly cross-pollinate.

Bumble Bees

Mostly Black Bumble Bees

- Abdomen is mostly black, with some yellow hairs on the sides of abdomen
- Thorax can be black and/or yellow
- Species include: *Bombus insularis*

Photo: Diane Wilson

Figure 62. *Bombus insularis*, cuckoo bumble bee.

Mostly Yellow Bumble Bees

- Abdomen is mostly yellow with a black tip
- The thorax can be both black and yellow
- Species include: *Bombus fervidus*

Photo: Diane Wilson

Figure 63. *Bombus fervidus*, golden northern bumble bee.

White or Yellow Tip Bumble Bees

- Tip of abdomen can be white or yellow. The upper abdomen can be black or yellow
- Thorax can be black or yellow
- Species include: *Bombus occidentalis*

Photo: Diane Wilson

Figure 64. *Bombus occidentalis,* western bumble bee.

Did You Know?

- *Bombus insularis* is a cuckoo bee named after the cuckoo bird, because it lays eggs in another bumble bee's nest. The worker bumble bees will care for this parasitic bee's offspring.
- Cuckoo bees do not have pollen baskets like other bumble bees. They also appear less hairy than other bumble bees.

Green Metallic Bees

- Size: Medium
- Color: Metallic green thorax and head, females have a metallic green abdomen, and males have black and yellow stripes on abdomen
- Most carry pollen on hind legs
- Fast flying
- Polylectic

Note: Some hairy belly bees may also appear metallic green. Check where the bee is carrying pollen. Green metallic bees will carry pollen on their hind legs, while hairy belly bees carry pollen on the underside of their abdomen.

Compare hairy belly bees and green metallic bees. Can you spot where the bee is carrying pollen?

Shiny and Slender Body

Photo: Susan Ellis, Bugwood.org

Figure 65. Female *Agapostemon* sp.

Stripes on Abdomen

Photo: Richard Greene

Figure 66. Male *Agapostemon* sp. have black and yellow stripes on the abdomen and a green thorax.

Pollen on Hind Legs

Photo: Lisa Mason

Figure 67. Note the pollen on the legs of the *Agapostemon* sp.

Photo: Diane Wilson

Figure 68. *Augochlorella aurata.*

Hairy Belly Bees

- Includes leafcutter, mason, wool carder, and resin bees
- Size: Small to medium
- Color: Black with white/silvery hairs, white bands on abdomen
- Prominent hair on underside of abdomen, often yellowish in appearance from pollen
- Carries pollen on the underside of abdomen
- Polylectic

Note: Some hairy belly bees may appear metallic green. Check where the bee is carrying pollen. Green metallic bees will carry pollen on their hind legs, while hairy belly bees carry pollen on the underside of their abdomen. Compare hairy belly bees and green metallic bees. Can you spot where the bee is carrying pollen?

Did You Know?

- Leafcutter bees can be seen clipping portions of leaves on trees. They roll up the leaf and carry it back to their cavity nest. They use the leaf pieces to line and seal each egg chamber.

Figure 69. Leafcutter bees have cut pieces of leaf to take back to their nest.

White-striped Abdomen Bees

- Gray to black with thin white stripes on abdomen
- Hair easily seen on body, especially on abdomen
- Bottom of abdomen usually bright yellow with pollen
- Size is variable

Photo: Richard Greene

Figure 70. Note the white stripes on the black abdomen.

Photo: Richard Greene

Figure 71. Note the pollen on the underside of the abdomen.

Hairy Belly Bees

Wasp-like Bees

- Wide abdomen
- Wasp-like markings (black and yellow stripes, varied patterns)
- Hair on belly is harder to see
- Polylectic

Photo: Lisa Mason

Figure 72. Wool carder bee, *Anthidium manicatum*.

Photo: Lisa Mason

Figure 73. Resin bee, *Anthidium* sp.

Did You Know?

- Female *Anthidium* species will use their mandibles to take the "fuzz" off plants. They use it to line their nests.

Other Hairy Belly Bees

- Size variable
- Hair visible on abdomen

Photo: Diane Wilson

Figure 74. *Hoplitis* sp.

Photo: Diane Wilson

Figure 75. *Osmia* sp.

Striped Sweat Bees

- Size: Small to medium
- Narrow body shape
- Color: Usually black
- Stripes on abdomen may be white to dark gray
- Hair on hind legs can collect pollen
- Crawls to the base of flowers, be sure to look deep inside flowers
- Fast flier with jagged movements
- Common
- Polylectic

Photo: Joseph Berger, Bugwood.org

Figure 76. Note the pollen on the legs.

Pollen on Legs

Photo: Diane Wilson

Figure 77. *Halictus* sp.

Stripes on Abdomen

Photo: Diane Wilson

Figure 78. *Halictus* sp.

Small-sized

Photo: Lisa Mason

Figure 79. *Halictus* sp.

Medium-sized

Photo: Diane Wilson

Figure 80. *Halictus* sp.

Tiny Dark Bees

- Size: Tiny
- Narrow body shape
- Color: Black, sometimes looks metallic
- Can swarm flowers
- Some have white or yellow markings on face
- Hair on hind legs can collect pollen
- Crawls to the base of flowers, be sure to look deep inside flower
- Flies fast with jagged movements
- Polylectic

Photo: MaLisa Spring

Figure 81. *Lasioglossum* sp. inside a flower. At first glance it may look like another insect because it is so small, but note all the bee characteristics.

Yellow Markings on Face

Photo: MaLisa Spring

Figure 82. *Hylaeus* sp., yellow-faced bee.

Hairs on Hind Legs

Photo: MaLisa Spring

Figure 83. *Lasioglossum* sp.

Metallic Black

Photo: MaLisa Spring

Figure 84. *Ceratina* sp., small carpenter bee.

Photo: Diane Wilson

Figure 85. *Ceratina* sp., small carpenter bee.

Hairy Leg Bees

- Size: Medium to large
- Short, dense hair on thorax
- Pollen collection on the hair of legs, but the entire body will also be covered in pollen
- Fast flying, often will fly in a “figure 8” pattern
- Male bees have long antennae and striped body
- Polylectic

Photo: Richard Greene

Figure 86. A digger bee, *Anthophora urbana.*

Dense Hair

Photo: Diane Wilson

Figure 87. *Diadasia enavata.*

Pollen-collecting Hair on Legs

Photo: Diane Wilson

Figure 88. *Melissodes* sp., long-horned bee.

Color Variation

Photo: Diane Wilson

Figure 89. *Melissodes bimaculata.*

Pollen-covered Body

Photo: Diane Wilson

Figure 90. *Svastra obliqua.*

Cuckoo Bees

- Size: Variable from small to large
- Not very hairy
- Body Color: Black, white, red, or yellow
- May have wasp-like markings made from short, thick hairs
- Leg color: Red or black
- No pollen carrying structure
- Polylectic

Wasp-like Markings

Photo: Diane Wilson

Figure 91. *Nomada* sp.

Did You Know?

- Just as *Bombus insularis* is a cuckoo bee laying eggs in a bumble bee nest (pg. 21), other parasitic cuckoo bees mimic other types of bees to lay eggs in other bee nests.
- For example, *Coelioxys* sp. look similar to *Megachile* sp. (Hairy Belly Bees) and parasitize them.

Photo: Diane Wilson

Figure 92. Note the pointy abdomen on the *Coelioxys* sp.

Photo: Richard Greene

Figure 93. Note the hair on the *Megachile* sp.

Variations in Color

Photo: Whitney Cranshaw, Colorado State University, Bugwood.org

Figure 94. *Epeolus* sp.

Photo: Diane Wilson

Figure 95. *Nomada* sp.

Photo: Diane Wilson

Figure 96. *Holcopasites calliopsidis.*

Native Bee Watch - A Northern Colorado Citizen Science Project

Data Collection Sheet

Names of Participants: _____ **Transect Number** _____ **Date:** _____

Garden Location: _____

Instructions: Fill in your name and your partner's name, date and garden location at the top. Record the start time, end time, and circle the appropriate weather information. Fill in the table as you make observations. Be as specific as possible. Observe each plant for 2 minutes, and count and identify the bees. After the 2 minutes, record the plant species, number of plants and number of flowers. One person should track the timer for 2 minutes and record the observations. The other person should do the observing. Partners should take turns. Please record any additional observations at the end of the session. Return this data sheet to the researcher you are working with.

Start Time: _____ : _____ **End Time:** _____ : _____

Weather: (Circle one) 40s 50s 60s 70s 80s 90s 100s

Wind: (Circle one) Still Light Wind Windy Gusty **Sky:** (Circle one) Clear Partly Cloudy Mostly Cloudy Overcast

Name of Plant	# of Plants	# of Flowers	Honey Bee	Bumble Bee	Hairy Leg Bee	Green Metallic Bee	Striped Sweat Bee	Tiny Dark Bee	Hairy Belly Bee	Cuckoo Bee	Other

EXAMPLE

Native Bee Watch - A Northern Colorado Citizen Science Project

Data Collection Sheet

Names of Participants: LISA MASON

Date: 6/7/16

Garden Location: GARDENS AT SPRING CREEK

Instructions: Fill in your name and your partner's name, date and garden location at the top. Record the start time, end time, and circle the appropriate weather information. Fill in the table as you make observations. Be as specific as possible. Observe each plant for 2 minutes, and count and identify the bees. After the 2 minutes, record the plant species, number of plants and number of flowers. One person should track the timer for 2 minutes and record the observations. The other person should do the observing. Partners should take turns. Please record any additional observations at the end of the session. Return this data sheet to the researcher you are working with.

Start Time: 9 : 06 **End Time:** 10 : 52

Weather: 40s 50s 60s (70s) 80s 90s 100s

Wind: Still (Light Wind) Windy Gusty **Sky:** (Clear) Partly Cloudy Mostly Cloudy Overcast

Name of Plant	# of Plants	# of Flowers	Honey Bee	Bumble Bee	Hairy Leg Bee	Green Metallic Bee	Striped Sweat Bee	Tiny Dark Bee	Hairy Belly Bee	Cuckoo Bee	Other
CONEFLOWER, PURPLE	3	17	II	I	I	III	I				
PENSTEMON, PINK	5	29		IIII				I			
ENGLISH LAVENDER	1	500+	IIII IIII								
RABBITBRUSH	1	500+	IIII II	III							
CATMINT	2	~ 60	IIII	I					II		
COLUMBINE, YELLOW	2	11					II	I			
PENSTEMON, PINK	3	22	I	II							

References and Resources

References

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Colorado Resources

City of Fort Collins Natural Areas
www.fcgov.com/naturalareas/

City of Fort Collins Nature in the City
www.fcgov.com/natureinthecity/

Colorado State University
www.colostate.edu/

Colorado State University Flower Trial Gardens
http://www.flowertrials.colostate.edu/

Plant Select®
www.plantselect.org

The Gardens on Spring Creek
http://www.fcgov.com/gardens/

National Resources

The Pollinator Partnership
www.pollinator.org

The Xerces Society for Invertebrate Conservation
www.xerces.org

More Citizen Science Opportunities

Bug Guide
www.bugguide.net

Discover Life
www.discoverlife.org

iNaturalist
www.inaturalist.org

The Great Sunflower Project
www.greatsunflower.org

NativeBeeWatch.WordPress.com