Discovering wild bees
Lesson 1: Connecting with bees

<table>
<tr><td>Grades</td><td>4–5</td><td>Duration</td><td>75 min.</td></tr>
<tr><td>Subjects</td><td colspan="3">Science, English language arts</td></tr>
<tr><td>Essential question</td><td colspan="3">Why is identifying species important?</td></tr>
<tr><td>Content and language objectives</td><td colspan="3">• Students will be able to explain why naming and identifying species is important to connecting with nature.
• Students will be able to identify bees based on structures and behaviors.</td></tr>
<tr><td>Summary</td><td colspan="3">In this lesson, students understand the importance of naming species in nature for scientific purposes and for building community. Students practice using a basic field guide and are introduced to Seek by iNaturalist as a tool to support the practice of naming and identifying species in the future.</td></tr>
<tr><td rowspan="2">Standards</td><td colspan="3">Next Generation Science Standards:
4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Science and Engineering Practice: Construct an argument with evidence, data, and/or a model.</td></tr>
<tr><td colspan="3">Common Core English Language Arts:
CCSS.ELA-Literacy.SL.4/5.1
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.
CCSS.ELA-Literacy.SL.4/5.3
Identify the reasons and evidence a speaker provides to support particular points.</td></tr>
<tr><td>Language frames</td><td>Describe and explain
A defining characteristic is ...
An example of ___ is ____ ...
____ is known for ...
____ is important because ...
____ is _____long.</td><td colspan="2">Compare and contrast
One similarity/difference is ...
Their common characteristics include ...
____ and ____ are different because ...
____has ____, but ____ has ____.
They both ...</td></tr>
</table>

	_____ is/has _____. The bee's ____ is ____.	
Vocabulary	to identify identification native/wild non-native managed solitary social **other descriptive language*	color (ish)/ —colored bright/dark/light/metallic inches/centimeters/millimeters wingspan hairy smooth head thorax abdomen
Materials	Bee ID guide Wild Guardians: Discovering wild bees video Teacher resource: Modeled and shared bee images	Field images Handout: Quotes Handout: Wild bees: Ways YOU can help! Bonus worksheets
Teacher note	*This lesson introduces bees in two groups based on their social behavior, social (live in colonies) and solitary (don't live in colonies). The purpose of pointing out these groups is to draw attention to the fact that a majority of wild bees are solitary, and since we often learn about social bees, solitary bee habits are different than most people are familiar with. The names used in the lesson are common names, as appropriate for this age group, there are often multiple common names used for a species, so you can adjust for your area.* *The bees on the handouts and in the video may not be local to your ecosystem. To find local bees to introduce to your students, Mongabay Kids recommends looking up your local park district or a college or university entomology department, which may be able to provide identification materials. Or, you can find local bees on iNaturalist, using the Explore page to filter observations by the bee family and your specific city or region.* *In this lesson it is recommended you show students how to use the app Seek by iNaturalist. Before class, download the app and explore in order to feel comfortable sharing. Use this guide for help.*	

Engage and prepare

1. Ask, “Why is naming important?” Students brainstorm ideas, including: to avoid confusion, to identify something/someone, because something is special, etc.
2. Introduce students to Robin Wall Kimmerer.
    a. She is an author, professor, and enrolled member of the Citizen Potawatomi Nation.
    b. She is a Wild Guardian and writes about getting to know and protecting your community’s ecosystems.
3. Assign students a quote from the handout in a small group. *Alternatively, choose one quote to discuss as a class.*
    a. Small groups read the quote and complete the handout.
    b. Four versions of the handout are provided, to allow differing perspectives to arise. Model using one of the quotes, if desired.
    c. Students from each group share their quote and summary.
    d. The class discusses and adds to the brainstorm, “Why is naming important?”
4. Tell students for all these reasons, we are going to practice naming bees in our community.

Modeled and shared instruction

1. Project an image of a carpenter bee and ask, “What is this?” (See the teacher resource, “Modeled and shared bee images.”)
    a. Some students may have a deeper understanding of insects in your community and be able to identify it. In general, if students say it is a bee or an insect, that is okay, too!
    b. Tell students (or confirm) that it has a particular name.
    c. Zoom in to show the bee features.
    d. Use the describe and explain language frames to talk about the bee. Encourage students to practice the frames and vocabulary.
    e. Label the bee with its specific name.
2. Project an image of a mining bee and ask students, “What is this?”
    a. Students may identify it correctly or not.
    b. Zoom in and show the differences between a carpenter bee and a mining bee. Point out the features.
    c. Use the describe and explain language frames to talk about the bee. Encourage students to practice the frames and vocabulary.
    d. Use the compare and contrast language frames to explain how the bee is different. Encourage students to practice the frames and vocabulary.

e. Label the bee with its specific name.

3. Ask students, “Why does this matter? Why is naming bees important?”
4. Play “Discovering wild bees video” (0:00–3:50).
5. Return to the brainstorm from step 1, ask “Why is naming important?” Students add ideas about science and nature based on the bees they saw in the video.

Collaborative and independent practice

1. Project the “Bee ID guide” and discuss different types of bees, their life cycle and how to name parts.
2. Model identifying a bee from the “Field images” using the “Bee ID guide” to match the bee characteristics and behaviors. *(Can be projected for the class or printed for small groups.)*
3. In small groups or partners, pass out the images. Students use the ID Guide to name bees from the field images.
    a. Clues are provided on the field images to support students’ identification, since they may not be able to tell the differences in features easily. Discuss the clues regarding behavior or habitat to support their thinking.
    b. Encourage students to make an educated guess based on the information they have and explain their reasoning.

Evaluate and close
Call to action

1. Students share about their experience in using the field images, their labels, and explain their reasoning with any identifications they are unsure about.

    Possible reflection questions:

    a. What was the easiest bee to identify? Hardest? Why?
    b. How is this process different from being outside and identifying insects?
    c. What did you learn about identifying species?
    d. Why is naming important?
2. Watch the “Discovering wild bees video” (3:50–end).
3. Distribute the handout: “Wild bees: Ways YOU can help.”
4. Introduce students to the Seek app and show them how to use it to explore different species. Explain how this tool uses image recognition and can help you understand the diversity of bees in your area.
    a. You may choose to look into using iNaturalist instead. The iNaturalist app is a citizen science tool that uses community support to help ID species. This Educator’s guide can support you if you choose this option.

5. Share the option of downloading this app and becoming citizen scientists. Encourage students to discuss it with parents/guardians.
6. Students turn and talk to practice explaining why naming/identifying species is important to their caregivers.
7. Students record their answer to, “Why is identifying bees important?” on the handout to share with their caregivers.

Extension

- Show students pictures of hornets and wasps and discuss differences in both behavior and appearance. Encourage students to read this post to learn more.
- If your students want to learn more about bee anatomy and identification, visit these resources:
  - Bee basics: An introduction to our native bees
  - Arizona State: Ask a Biologist: Honey bee anatomy
  - Museum of the Earth: Bee-ology
  - USGS Bee Lab

Written by Emily Townsend in collaboration with Mongabay Kids.

About Wild Guardians

Mongabay Kids is the Kids Desk of Mongabay, a nonprofit environmental science and conservation news platform.

Wild Guardians is a multimedia educational series that uses videos, comics, and hands-on activities to engage grade 4–5 students in community-based interdisciplinary learning about how to be stewards of wild things and wild places in their community.

Website: kids.mongabay.com

Special thanks

This project was supported by a grant from The CEK Foundation Earth Focus Initiative.

Group Names _____ Date:_____

Quote 1:

"I find strength and comfort in this physical intimacy with the land, a sense of knowing the names of the rocks and knowing my place in the world."

-Robin Wall Kimmerer

1. Read the quote to yourself.
2. One person in your group reads the quote aloud.
3. Another person in your group reads the quote aloud.
4. Chunk the quote *(draw lines underneath the parts you say together*).
5. Underline words you don't know. Use a dictionary to look up a synonym.
6. Reread the quote.
7. Write a sentence summary of what you think Robin Wall Kimmerer is saying.

   _____

   _____.

8. Discuss: "Why is naming important?" Be ready to share your ideas.

Group Names _____ Date:_____

Quote 2:

"In indigenous ways of knowing, all beings are recognized as non-human persons, and all have their own names. It is a sign of respect to call a being by its name, and a sign of disrespect to ignore it. Words and names are the ways we humans build relationships, not only with each other, but also with plants."

-Robin Wall Kimmerer

1. Read the quote to yourself.
2. One person in your group reads the quote aloud.
3. Another person in your group reads the quote aloud.
4. Chunk the quote *(draw lines underneath the parts you say together*).
5. Underline words you don't know. Use a dictionary to look up a synonym.
6. Reread the quote.
7. Write a sentence summary of what you think Robin Wall Kimmerer is saying.

   _____

   _____.

8. Discuss: "Why is naming important?" Be ready to share your ideas.

Group Names _____ Date:_____

Quote 3:

"Intimate connection allows recognition in an all-too-often anonymous world … Intimacy gives us a different way of seeing."

-Robin Wall Kimmerer

1. Read the quote to yourself.
2. One person in your group reads the quote aloud.
3. Another person in your group reads the quote aloud.
4. Chunk the quote *(draw lines underneath the parts you say together*).
5. Underline words you don't know. Use a dictionary to look up a synonym.
6. Reread the quote.
7. Write a sentence summary of what you think Robin Wall Kimmerer is saying.

_____

_____.

8. Discuss: "Why is naming important?" Be ready to share your ideas.

Group Names _____ Date:_____

Quote 4:

"Names are the way we humans build relationship, not only with each other but with the living world. I'm trying to imagine what it would be like going through life not knowing the names of the plants and animals around you … I think it would be a little scary and disorienting — like being lost in a foreign city where you can't read the street signs."

-Robin Wall Kimmerer

1. Read the quote to yourself.
2. One person in your group reads the quote aloud.
3. Another person in your group reads the quote aloud.
4. Chunk the quote *(draw lines underneath the parts you say together*).
5. Underline words you don't know. Use a dictionary to look up a synonym.
6. Reread the quote.
7. Write a sentence summary of what you think Robin Wall Kimmerer is saying.

_____

_____.

8. Discuss: "Why is naming important?" Be ready to share your ideas.

Teacher resource:
Modeled and shared bee images

Modeled and shared step 1:

Species common name: carpenter bee

Example characteristics:

dark blue (ish)
metallic (colored)
large
antennae
hairy thorax
rounded abdomen

Example sentences:

A defining characteristic is the bee's metallic color.
An example of pollen collecting body parts **is** the bee's hairy thorax.
The (carpenter) bee **is known for** its large size.
The size **is important because** it helps it make holes in wood.
The bee **has** a head, thorax, and abdomen.
The bee's wings **are** blue.



Image: PhotoIncredible from Getty Images, via Canva

Modeled and shared step 2:

Species common name: mining bee

Example characteristics:

dark
black
fuzzy
small
antennae
hairy legs
hairy thorax

Example sentences:

A defining characteristic is the bee's small size.
An example of pollen collecting body parts **is** the bee's hairy legs.
The mining bee **is known for** its small size.
The hair **is important because** it collects pollen.
The bee **has** a head, thorax, and abdomen.
The bee's thorax **is** hairy.



Image: Wirestock from Getty Images, via Canva

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BEE ID GUIDE

WILD GUARDIANS
DISCOVERING WILD BEES

How are bees grouped?

Scientists group bees based on how closely they are related.

On this page you'll see a few types of bees that might live near you, along with clues you can use to identify them.

Closely related bees often share behaviors and physical features, such as body size or how hairy they are.

Look closely! Do the bees in each group look similar to you? What do you notice about bees in different groups?

HONEY BEES





- size: small to medium
- stripes (bands) on abdomen
- live in colonies with a queen and workers
- build wax honeycombs

WHICH TYPES OF BEES HAVE YOU SEEN?

BUMBLE BEES





- size: medium to large
- live in colonies
- very hairy, even on the abdomen
- fuzzy, rounded appearance



CARPENTER BEES

- size: large to very large
- hairy thorax
- large, rounded abdomen
- bore holes in wood
- solitary









MINING BEES

- size: small to medium
- delicate looking
- hairy head, thorax, legs
- nest underground
- solitary









SWEAT BEES

- size: small, slender
- varying colors, some metallic
- fine hairs
- mostly solitary









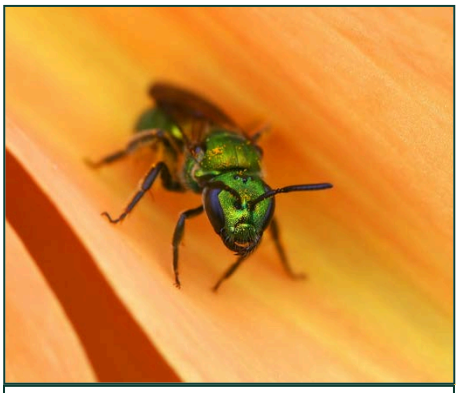
Bees not to scale. Images: Canva, iNaturalist.

FIELD IMAGES

WILD GUARDIANS
DISCOVERING WILD BEES



Honey bee or bumble bee?



About 8 mm (0.3 in) long



Large, smooth abdomen



Live in colonies



Fuzzy all over



Nests underground



Carpenter bee or bumble bee?



Small, solitary bee



Sweat bee or carpenter bee?

Use the Bee ID Guide and the clues to identify the bees in these cards.
Honey bee, bumble bee, carpenter bee, sweat bee, or mining bee?

Images: Canva

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FIELD IMAGES

WILD GUARDIANS
DISCOVERING WILD BEES



Bores holes in wood



Sweat bee or mining bee?



Small, slender



Fits on a fingertip, fuzzy thorax



A familiar bee



Hair on abdomen



Bumble bee or sweat bee?



Nests underground



Mining bee or sweat bee?

Use the Bee ID Guide and the clues to identify the bees in these cards.
Honey bee, bumble bee, carpenter bee, sweat bee, or mining bee?

Images: Canva, iNaturalist

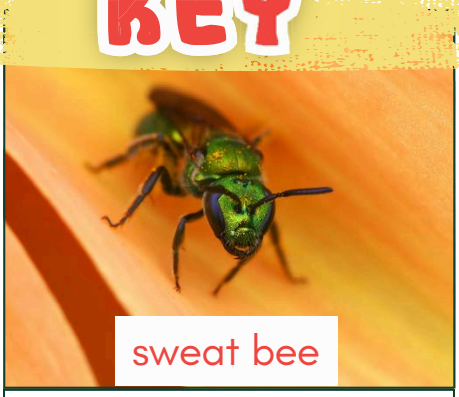
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FIELD IMAGES KEY

WILD GUARDIANS
DISCOVERING WILD BEES



Honey bee or bumble bee?



About 8 mm (0.3 in) long



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Nests underground



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FIELD IMAGES KEY

WILD GUARDIANS
DISCOVERING WILD BEES



Bores holes in wood



Sweat bee or mining bee?



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A familiar bee



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Bumble bee or sweat bee?



Nests underground



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Honey bee, bumble bee, carpenter bee, sweat bee, or mining bee?

Images: Canva, iNaturalist

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Name _____ Date_____

Wild bees: Ways YOU can help!

Did you know?

- There are more than 20,000 species of bees!
- Bees and other animals pollinate 75% of our food crops!
- Bees can live in colonies, but most wild bees are solitary.

What can you do to help wild bees?

- Plant native plants.
- Leave your yard or garden a little messy to provide nest sites *(bare soil for ground-nesting bees or hollow stems for cavity-nesting bees).*
- Avoid pesticides.
- Spread the word that wild bees are awesome!

Download the app Seek by iNaturalist to identify wild bees and other species in your community!

- Seek is a fun, privacy-focused, and gamified app. (You do not need an account to use Seek.)
- Seek provides live ID suggestions.
- Seek does not post your observations to a community, like iNaturalist, so it keeps your information private. However, you can choose to link Seek to an iNaturalist account if you want to share your sightings with others.
- You must be 13+ to create an iNaturalist account, so signing up with your caregiver is a great option!
- Click here or use the QR code for directions for use and guide to downloading Seek.

My reflection:

Why is naming and identifying species of bees (and other plants and animals) important?

_____

_____

_____.

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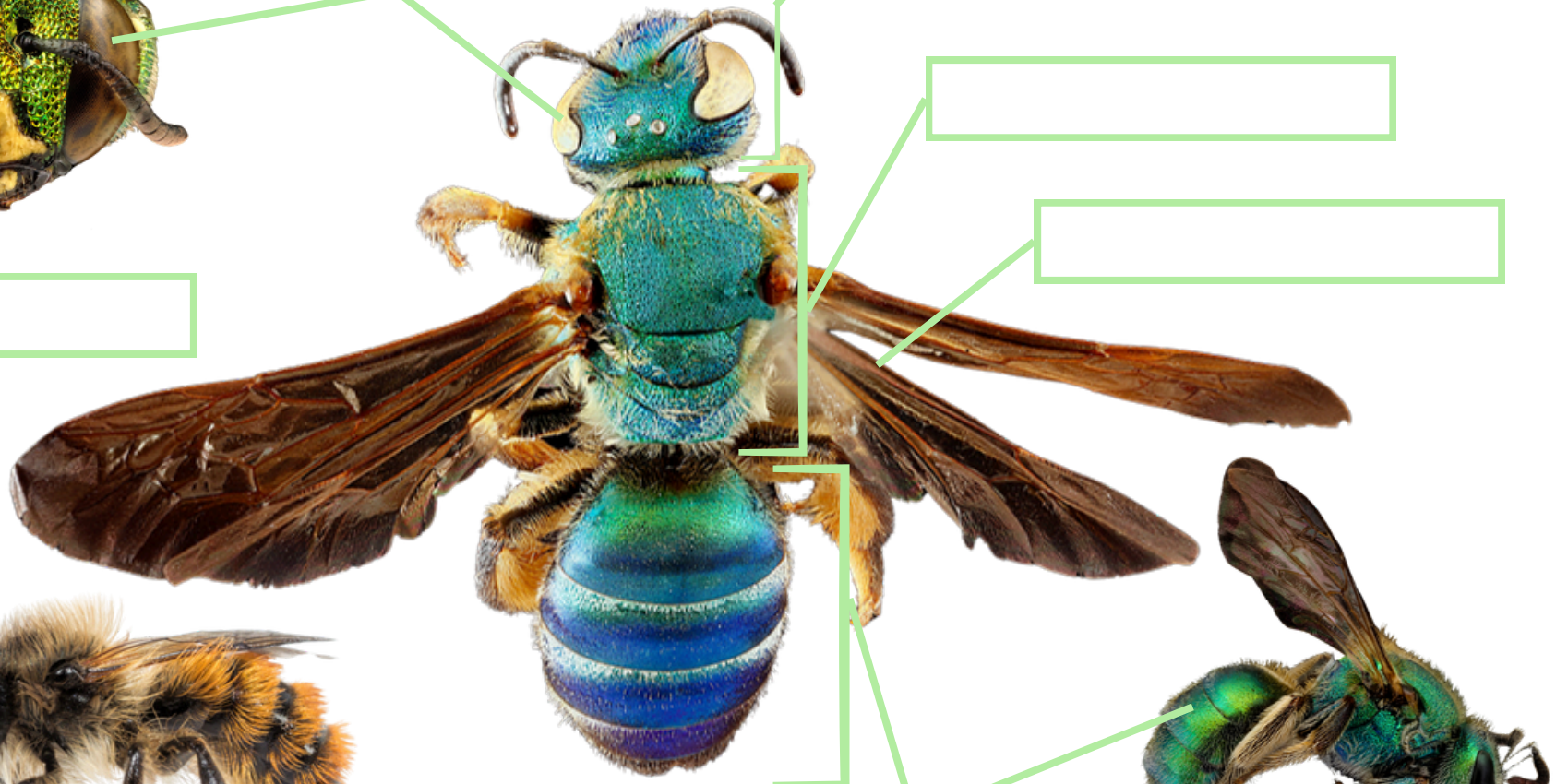
BEE BODY PARTS

WILD GUARDIANS
DISCOVERING WILD BEES

Label the bee body parts.

Name _____







Bees not to scale. Images: Canva, USGS Bee Lab (Public domain).

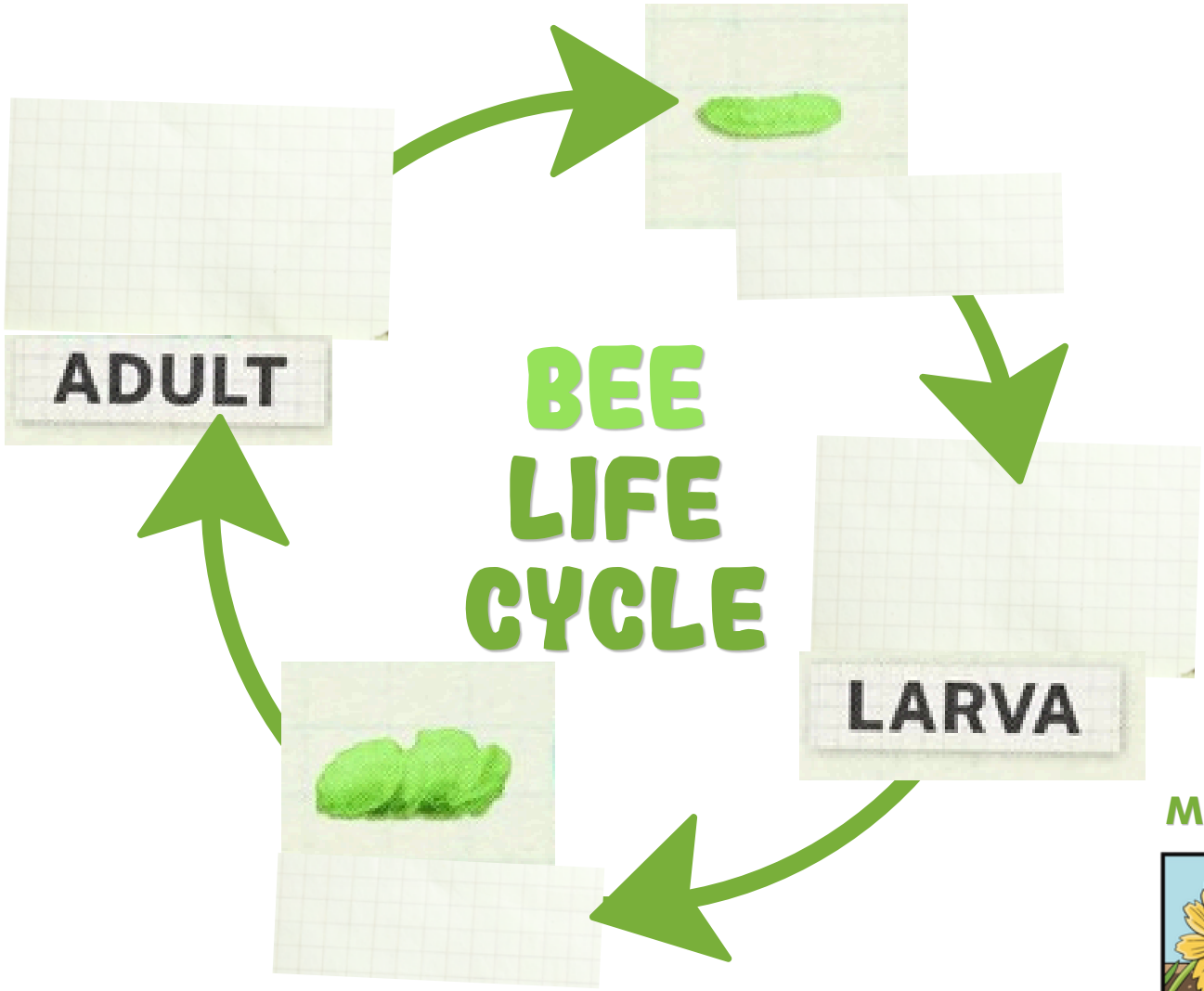
MONGABAY KIDS

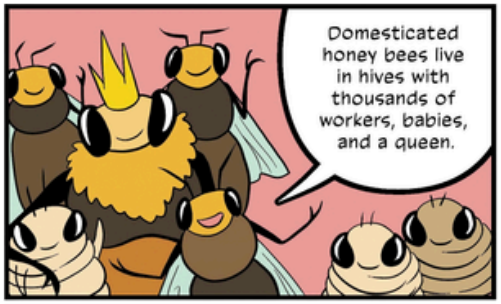
BEE LIFE CYCLE

WILD GUARDIANS
DISCOVERING WILD BEES

Fill in the blanks with either a label or a drawing.

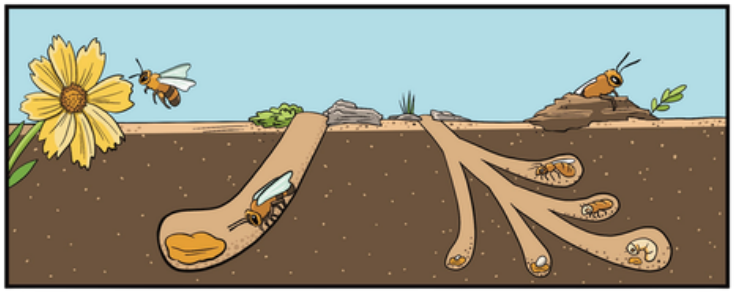
Name _____







Most bees nest underground!



Graphics: John McColgan
Illustrations: Molly Schafer