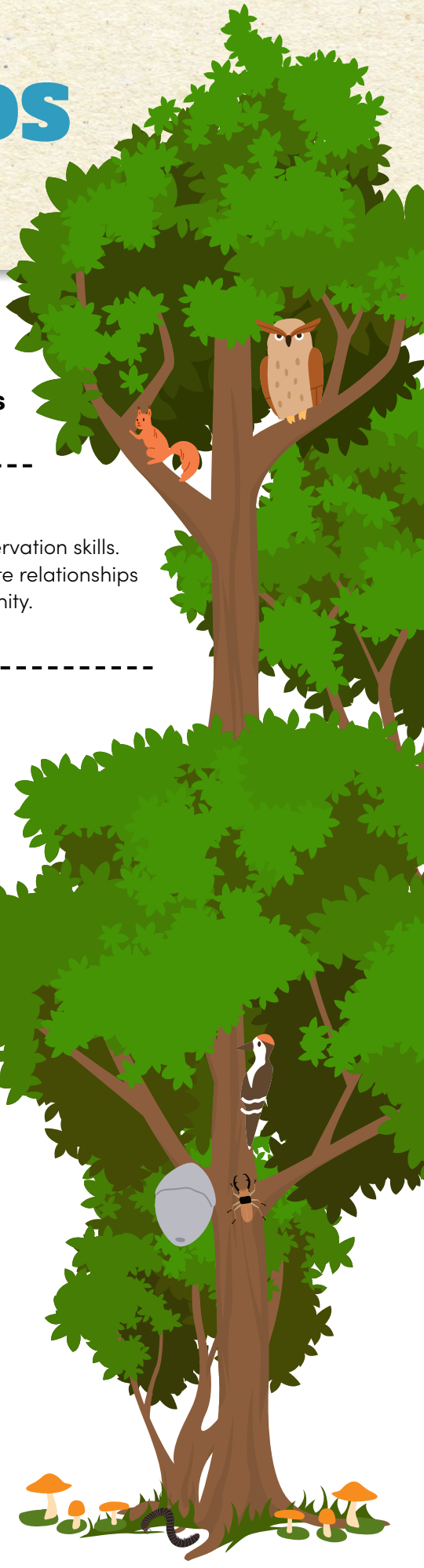
PLANT HEROES

WHO NEEDS TREES?



THEME

- ○ Forest Health
- ☑ Ecology
- ○ Plant Conservation

TYPE OF LESSON

- ☑ Instructor-Led
- ☑ Hands-On
- ☑ Garden Exploration

POSSIBLE WAYS TO LEAD LESSON

- ☑ Outdoors
- ○ Virtual
- ○ Classroom
- ○ Other:

TEACHING STRATEGY

- ☑ Place-Based Learning
- ○ Storytelling
- ☑ Nature Play
- ○ Art / Movement
- ○ Other:

STANDARDS

- **NGSS, 3-LS2-1. Ecosystems.** Construct an argument that some animals form groups that help members survive.
- **NGSS, 4-LS1-1. From Molecules to Organisms.** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- **NGSS, 5-LS2-1. Ecosystems.** Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
- **CCSS.ELA-LITERACY.SL.3/4/5.1.** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3/4/5 topics and texts, building on others' ideas and expressing their own clearly.

GRADES 3–5

DURATION 60 minutes

LESSON GOALS

- Learners strengthen their observation skills.
- Learners describe and evaluate relationships that are part of a tree community.

LESSON SUMMARY

Learners look for signs of life around a tree from four perspectives, far away to up close. They discuss the sustainability of the relationships they observe in this unique tree community.

WORD BANK

community
invertebrate
relationship
sustainable
vertebrate

WHO NEEDS TREES?

PRINTED MATERIALS (INCLUDED)

Community Example Cards (one set per learner or per group—instructor's choice)

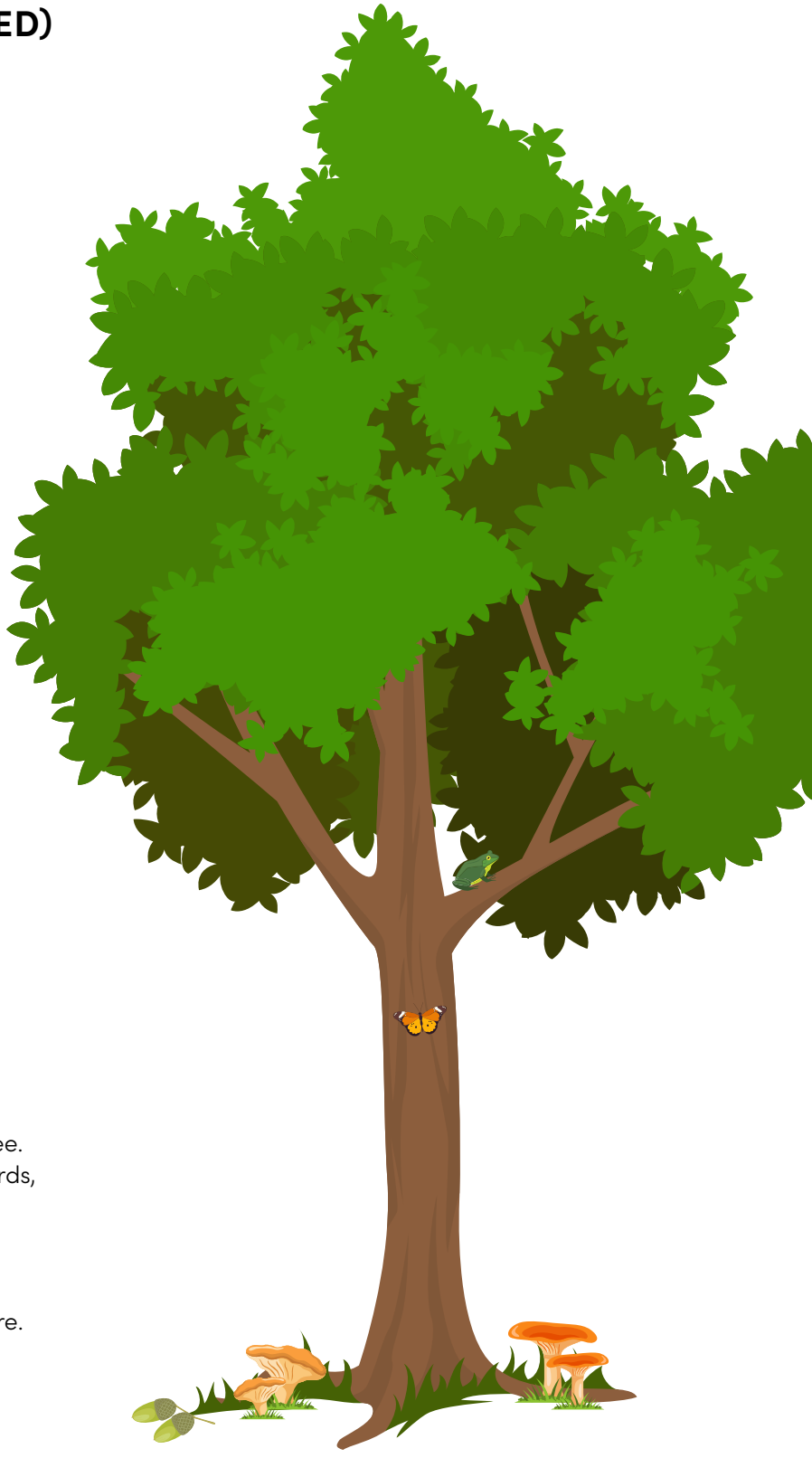
- Viewpoint 1: The biological community
- Viewpoint 2: Vertebrates that live in trees
- Viewpoint 3: Invertebrates that live in trees
- Viewpoint 4: Fungi and plants

OTHER MATERIALS

- Magnifying glasses (one per learner)
- Clipboards with paper (one per learner)
- Crayons, colored pencils, writing pencils

SETUP

1. Review the **lesson procedure**.
2. Review and consider the optional **pre-** and **post-lesson explorations**.
3. Prepare lesson materials by printing out the **community example cards** and gathering **other materials**.
4. Preselect a tree in the garden for learners to investigate, and inspect it for life or signs of life. Look up specific information about this tree to share with learners.
5. Identify four places to stop at to view the tree:
    - **Viewpoint 1: The biological community.** Find a spot where you can see the whole tree. This is where learners will first need clipboards, paper, and writing/drawing utensils.
    - **Viewpoint 2:** Vertebrates that live in trees.
    - **Viewpoint 3:** Invertebrates that live in trees. You'll need sanitized magnifying glasses here.
    - **Viewpoint 4:** Fungi and plants.

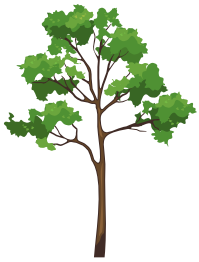


WHO NEEDS TREES?

LESSON PROCEDURE

1. Optional: Complete one or more of the **pre-lesson explorations.**

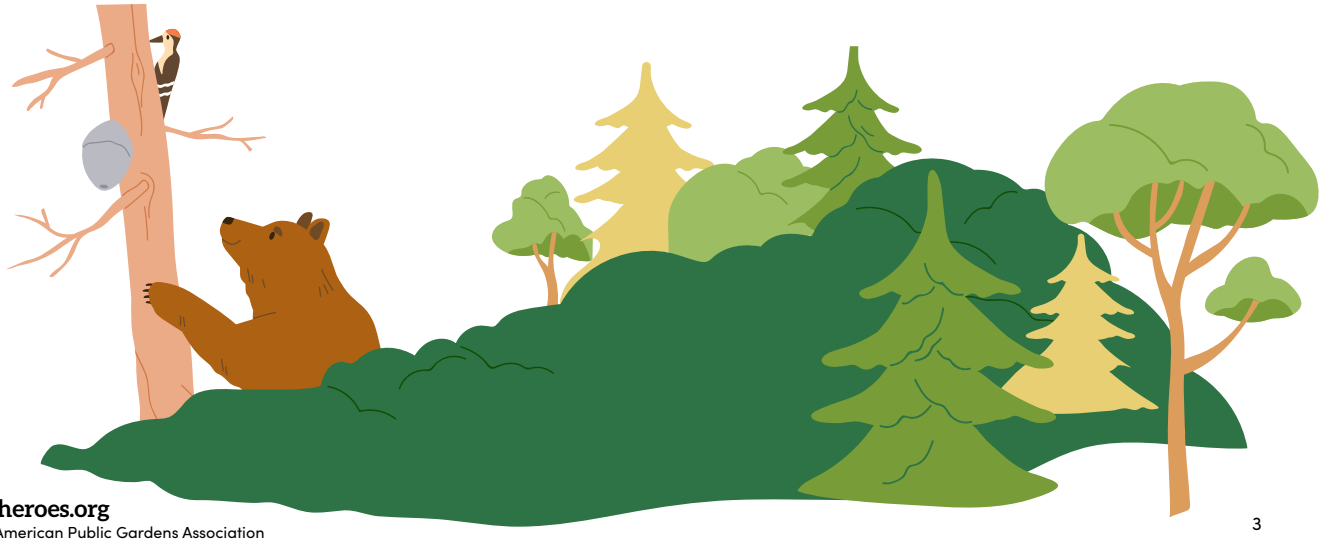
2. Visit **Viewpoint 1: The biological community.**



- Begin by standing far enough away from the tree so the group can see it in the context of the garden.
- Share the **lesson opener**. Explain in different ways that this tree supports life, and describe how it is itself a biological community.
- Ask the **lesson question** for Viewpoint 1.
- After learners share things they notice, the instructor can provide some information about this tree (for example, its name, history, and special adaptations).
- Have learners look at the **community example card** for Viewpoint 1.
- Hand out clipboards and writing utensils. Have learners write or draw one observation about Viewpoint 1 and the biological community of this tree.
- Walk quietly toward the tree (and toward Viewpoint 2) with the group until learners spot signs of life.

3. Visit **Viewpoint 2: Vertebrates** (look for birds, mammals, reptiles, and amphibians).

- Have learners describe an animal they see, and encourage them to help others spot it.
- Instead of the animals themselves, learners may notice signs of animals, such as nests; this is also excellent information to observe.
- Use the **lesson questions** to guide the conversation.
- Have learners look at the **community example card** for Viewpoint 2.
- Have learners write or draw one observation about Viewpoint 2 and a vertebrate that has a relationship with this tree.
- Have learners predict what other kinds of life they might see as they get closer.
- Again walking quietly, move closer to the tree until you arrive at Viewpoint 3.



WHO NEEDS TREES?

4. Visit **Viewpoint 3: Invertebrates** (look for insects, spiders, worms, etc).

- While under the branches of the tree, pass out the magnifying glasses and demonstrate how to use them using your hand as an example.
- Check for understanding by having learners model how to use them.
- Allow learners 3–5 minutes to explore the nooks and crannies of the tree. Visit these areas of excitement, and have the learners describe what they see.
- After the invertebrate exploration, have learners sit beneath the tree and review what they discovered. Have them brainstorm other types of life that they didn't see but imagine might live here.
- Use the **lesson questions** to guide the conversation as appropriate.
- Have learners look at the **community example card** for Viewpoint 3.
- Have learners write or draw one observation about Viewpoint 3 and an invertebrate that has a relationship with this tree.
- Move on to Viewpoint 4.

5. Visit **Viewpoint 4: Fungi and plants.**

- Have the learners look for fungi and lichens on the tree branches and trunk. They may also find plants such as mosses and vines growing on the tree.
- Have learners guess what might be living underneath the ground among the roots.
- Show the **community example card** for Viewpoint 4, which has an image of a fungal network, and ask the lesson questions again, this time focusing on the fungi.
- Have learners write or draw one observation about Viewpoint 4 and a fungus or plant that has a relationship with this tree.

6. Return to **Viewpoint 1: Reflection.**

- Have learners draw the tree and all of the biological community they learned it supports. At the bottom of the page, have learners write how they can help this biological community they observed continue to be sustainable.
- After the learners are finished drawing, use the final **lesson questions** to check for understanding.

7. Optional: Complete one or more of the **post-lesson explorations**.

WHO NEEDS TREES?

LESSON OPENER

Share the following with learners to orient them to the topic:

- This tree is a part of the garden's health because its roots help to hold soil in place, its leaves clean carbon from the air, and it makes food and oxygen for other living things. It is important to appreciate the quiet work of trees.
- This tree also supports a *biological community*. It is a home shared by a group of organisms. And because it is being shared, it is important that each of these organisms doesn't take too much from the tree.
- There are many different types of animals, plants, and fungi that use the tree for food and shelter.
    - Birds, mammals, reptiles, and amphibians are vertebrate animals or animals with a backbone.
    - There are also invertebrate animals, like insects, which don't have a backbone.
    - Both vertebrates and invertebrates use trees. Birds build nests in between branches to shelter their young from sun, rain, and predators. Insects may eat leaves and bark for food.
    - Plants may grow in the shade of the tree canopy or even on the trunk or branches.
    - Among the roots grows a network of fungi. It looks very similar to how we would imagine tree roots growing—and a little like cobwebs, too. These fungi feed on the carbohydrates that trees produce through photosynthesis. In return, the fungi help trees to absorb water and nutrients through their roots. Some of these networks send up fruiting bodies that we recognize as mushrooms.
- Many times we do not see animals in trees; however, we can see signs that they have been here. Animals signs include items we can see such as nests, cavities, feathers, fur, molts, holes in leaves, tracks and trails, cocoons, scat, and piles of eaten food. They also include sounds and smells such as bird songs and the smell of a skunk.

LESSON QUESTIONS

At Viewpoint 1:

- What do you notice about this tree, and why do you think I selected it for us to look at?

At Viewpoints 2, 3, and 4:

- Describe this organism. [*Examples: bird/insect/plant/fungus*] Or, if there are signs of activity by an organism that isn't there right now, what can you say about the organism that left this evidence?
- How is the organism using the tree to survive?
- Describe its relationship with the tree. How are they interacting?
- What would the organism do if the tree weren't there?
- Is this a sustainable relationship for this tree community?
    - What other things do you notice about the tree here? [*Examples: dead branches, human activity (carvings, cut limbs, etc), holes, wilted or yellowing leaves*]

At the end, back at Viewpoint 1.

The following questions can be used to check for understanding:

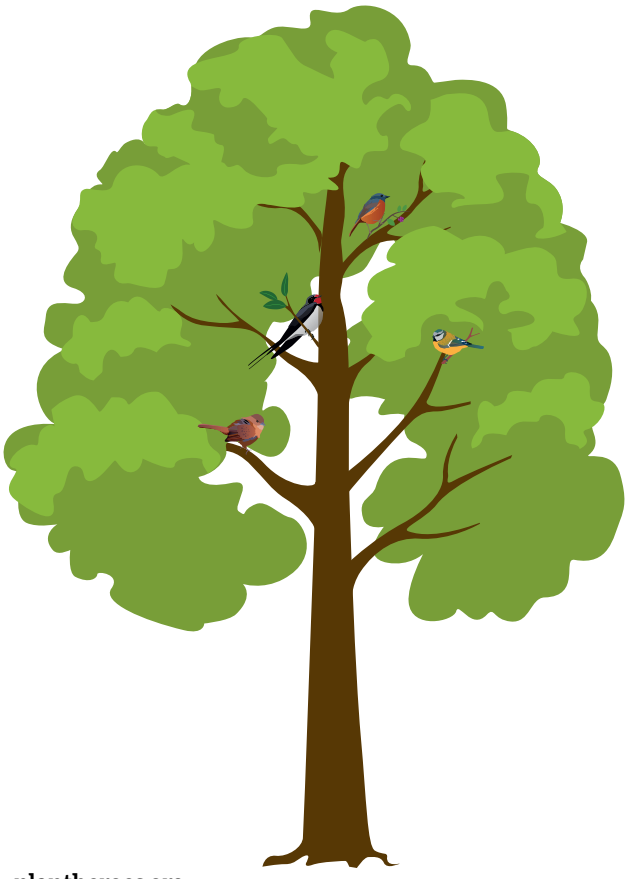
- What other kinds of biological communities can you imagine? [Examples: *beneath a rock, in a dead tree*]
- Can you describe a relationship between organisms that you have observed near your school or home?

WHO NEEDS TREES?

PRE-LESSON EXPLORATIONS

Have learners complete any of these prompts:

- **Parts of a tree:** Have learners create a nature mobile or an outdoor sculpture to familiarize themselves with the parts of a tree. If they use materials from nature, the instructor could hang these creations from tree branches and have learners observe how they change with time.
- **What will we find?** Borrow *The Living Forest* by Robert Llewellyn from a library and share the images to prepare learners for some of the organisms they might see. Have learners write a prediction about specific organisms they think they will discover in the garden. The instructor can hold onto these predictions and use them for review after the trip to the garden.



POST-LESSON EXPLORATIONS

Have learners complete any of these prompts:

- **Schoolyard investigation:** To expand learners' perspectives outward, the instructor can use a Google Earth image of their school or a nearby park to have learners choose trees in opposite parts of the schoolyard to investigate. Using the same observation techniques they used in the lesson, learners can either list or draw the members of the biological communities they observe in each tree. This activity can be an opportunity to compare different kinds of life found around the school's larger biological community.
- **Organism research**: To dig a little deeper into the kinds of life that thrive on trees, learners can research organisms they found, or ones they might expect to find, in their region. This can be done individually or in small groups focusing on vertebrates, invertebrates, plants, and fungi.
- **Look even closer**: Extend your learning by observing invertebrates that live on and around trees in the classroom. Gather living samples from your schoolyard, or purchase from a local pet store or online supplier. If collecting from your school yard remember to return the organisms where you found them. If purchasing, please dispose of them properly and do not release them outside. If you are new to working with living animals in the classroom, consult with your school's science coordinator about local polices and regulations.
- **The Wood Wide Web**: The "wood wide web" is a recently discovered phenomenon of fungi connecting trees through their root systems. Explore this phenomenon with your learners, and have them draw what they think it looks like before showing them the images or video. https://bit.ly/PH-WoodWideWeb
- **Technology**: Using Seek, an app by iNaturalist, learners can try to identify the different organisms they discover on the tree.

ADDITIONAL RESOURCES

Visit the Plant Heroes Pinterest page and follow us to view these resources and more at www.pinterest.com/plantheroes.

- **Trees and Other Organisms.** Background for educators about types of interactions in ecological communities: https://bit.ly/PH-TreesInsideOut
- **Six Surprising Ways Trees Support Wildlife.** Examples suitable for educators or for learners to use for reflection: https://bit.ly/PH-TreesInsideOut
- **Animal Tracks and Signs.** Evidence animals leave behind (use as background for educators or adapt for learners) from BioKIDS: https://bit.ly/PH-signsandtracks
- Background on animals that live in cavities of living or dead trees.
  - **Cavity Dwellers** (focused on the Southeast): https://bit.ly/PH-CavityDwellers
  - **Snags, Cavity Trees and Downed Logs** (focused on South Central US): https://bit.ly/PH-DownedLogs
  - **Snags – The Wildlife Tree** (focused on the Northwest): https://bit.ly/PH-Snags
- **The Soil Fungi: A Web of Life That Protects Trees and Fights Climate Change.** Background for educators on fungi and trees: https://bit.ly/PH-SoilFungi

WORD BANK

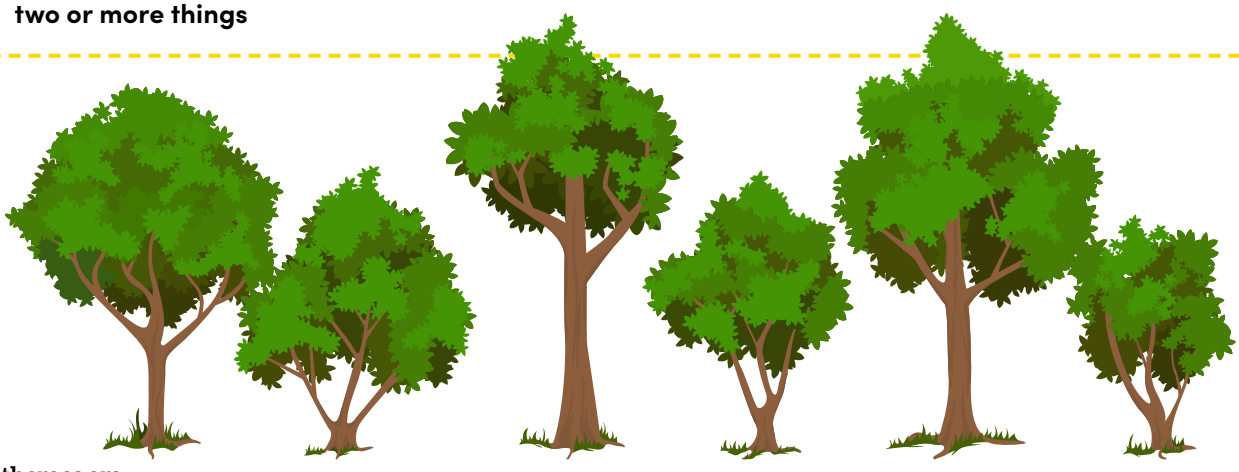
community: **a group of living things sharing a common space or purpose**

invertebrate: **an animal that does not have a backbone; examples include insects, spiders, mollusks (such as snails), and worms**

relationship: **an interaction between two or more things**

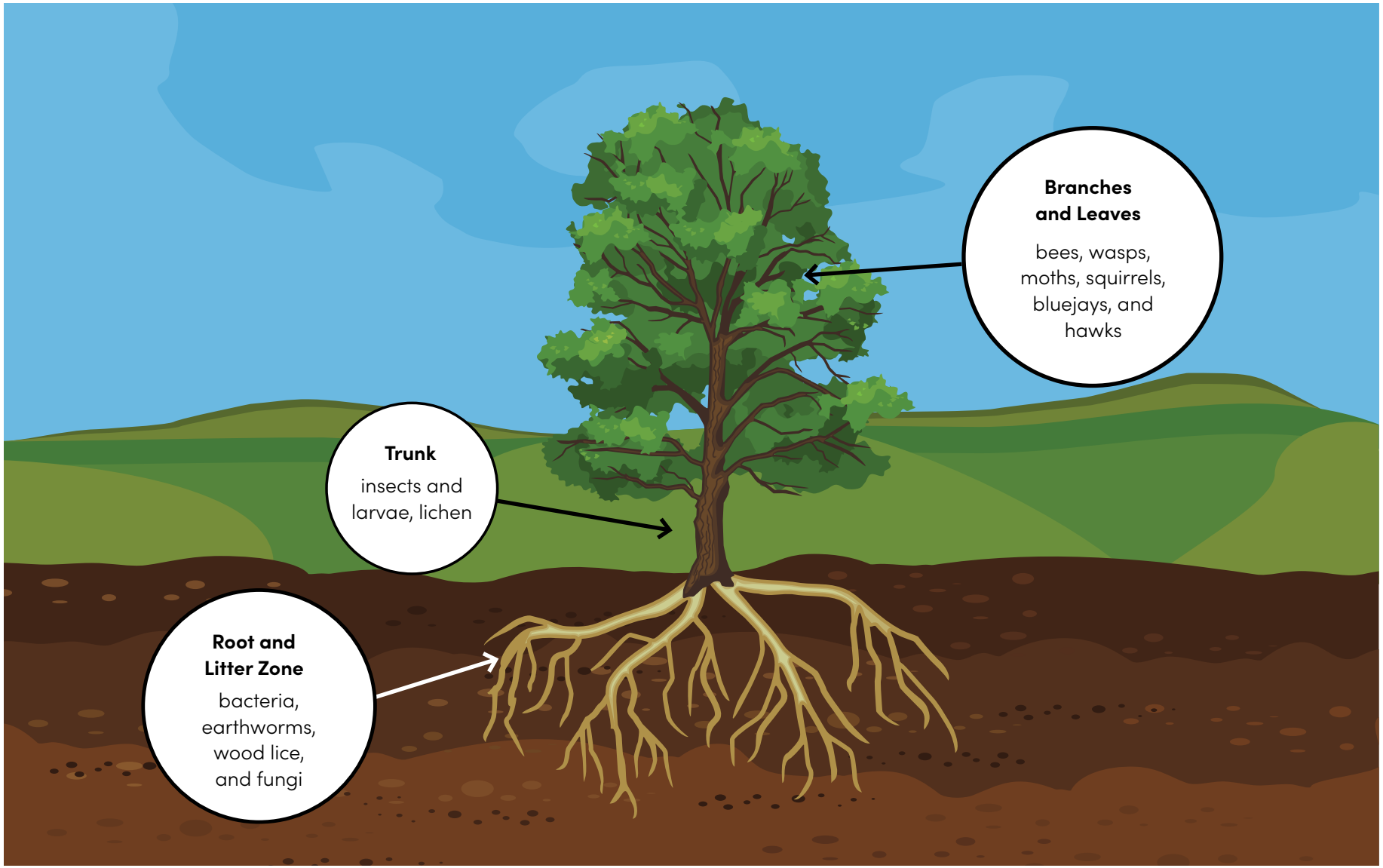
sustainable: **can be maintained over a long period of time without running out or being harmed**

vertebrate: **an animal that has a backbone; examples include mammals, birds, reptiles, amphibians, and fish**



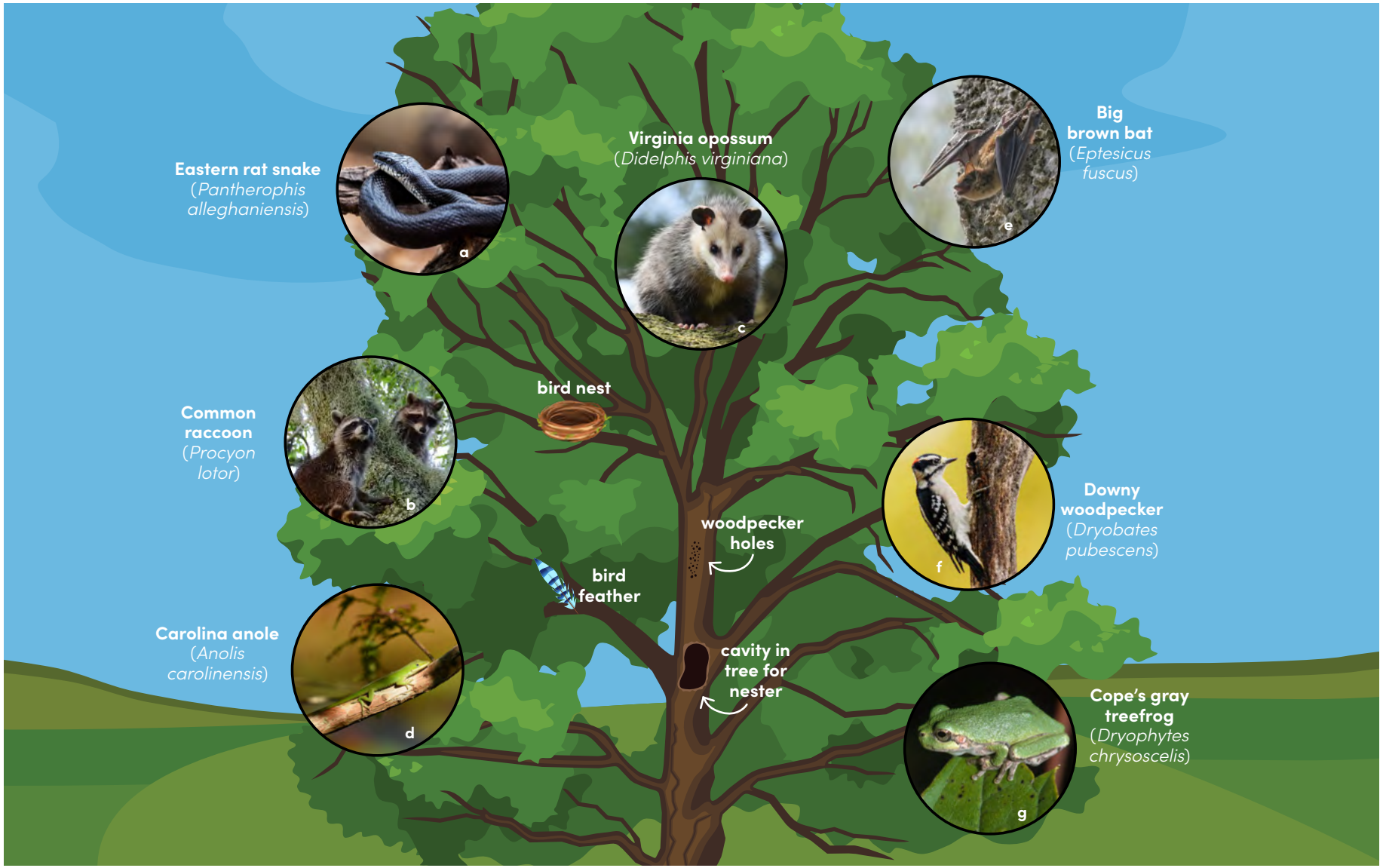
COMMUNITY EXAMPLE CARD

Viewpoint 1: The Biological Community



COMMUNITY EXAMPLE CARD

Viewpoint 2: Vertebrates That Live in Trees



Photos: a: TomWoodward, Flickr.com; b: Jill Mullhaupt, Flickr.com; c: Andy Reago & Chrissy McClarren, Flickr.com; d: Amaury Laport, Flickr.com; e: Ken Mattison, Flickr.com; f: N. Lewis NPS, Flickr.com; g: Mike Moran, Flickr.com

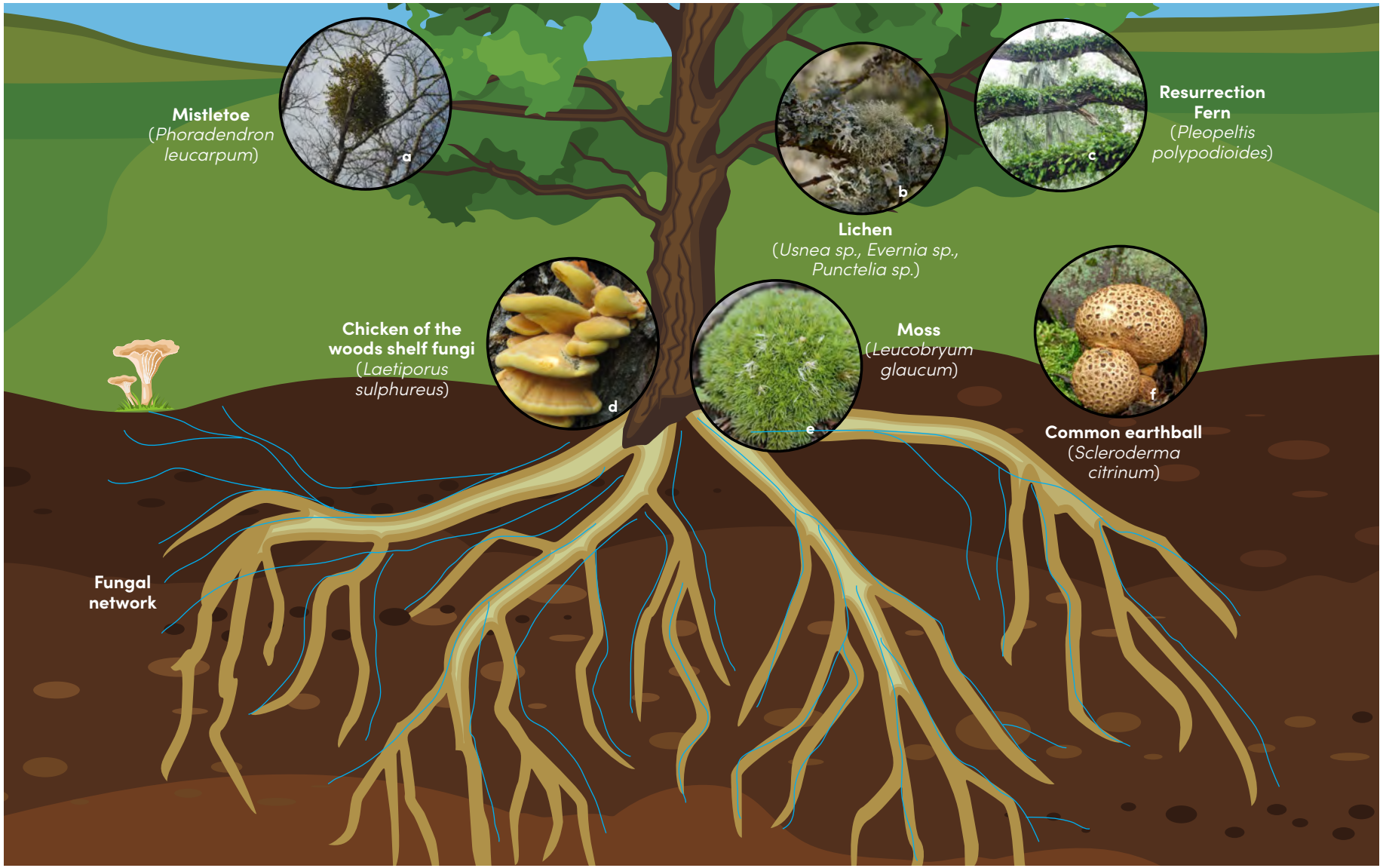
COMMUNITY EXAMPLE CARD

Viewpoint 3: Invertebrates That Live in Trees

Photos: a: Brett Whaley, Flickr.com; b: Matthew Beziat, Flickr.com; c: Laura Pontiggia, Flickr.com; d: Mark Beckemeyer, Flickr.com; e: Brian Henderson, Flickr.com

COMMUNITY EXAMPLE CARD

Viewpoint 4: Fungi and Plants



Photos: a: J Maughn, Flickr.com; b: Derell Licht, Flickr.com; c: GardeningSolutions, Flickr.com; d: Marjan Kustera, Flickr.com; e: Rob Routledge, Sault College, Bugwood.org; f: Jason Hollinger, Flickr.com