BugQuest:
The Secret Life of Your Schoolyard

Grade(s):
Elementary

Time:
60 minutes

Materials:
- Ecosystem role cards (1 per student)
- Ball of yarn or soft rope
- *Optional:* Photo of a grassy field or schoolyard (or access to an outdoor space)

Every day, we walk past hundreds, maybe even thousands, of tiny creatures without noticing them. Insects live in our schoolyards, parks, gardens, forests, and fields. Some pollinate flowers, some recycle (i.e., break down) dead plants and animals, and others become food for birds and mammals. Together, they help keep ecosystems healthy!

Do you know how many different kinds of insects live around your school? The answer might surprise you.

In this lesson, discover why insects are important, explore the idea of biodiversity through observation, and learn how you can contribute to real scientific research by participating in BugQuest!

Learning Goals

Students will:

- recognize that insects play important roles in ecosystems
- understand that biodiversity means there are many different kinds of living things
- explain why having many different species helps ecosystems stay healthy
- explore the diverse connections of insects and living things within an ecosystem
- contribute to a community science project by collecting insect samples

The BIG Question

Why do we need many different kinds of insects?

Minds On: How many bugs are hiding?

Show students a photo of a grassy field or schoolyard (or go out into the schoolyard!).

Ask:
- How many insects do you think are in this field?
- Which insects have you seen around our school?
- What feelings come up when you see insects (e.g., curiosity, excitement, fear, annoyance)? Why?
- Why do you think we usually notice birds and squirrels more than insects?

Tell students:

Although insects are tiny, **they make up about half of all known living things on Earth and about 80% of known animal species**. Scientists have discovered over 1 million insect species, but they estimate there may be millions more that have not yet been discovered!

Activity: Building the Ecosystem Web

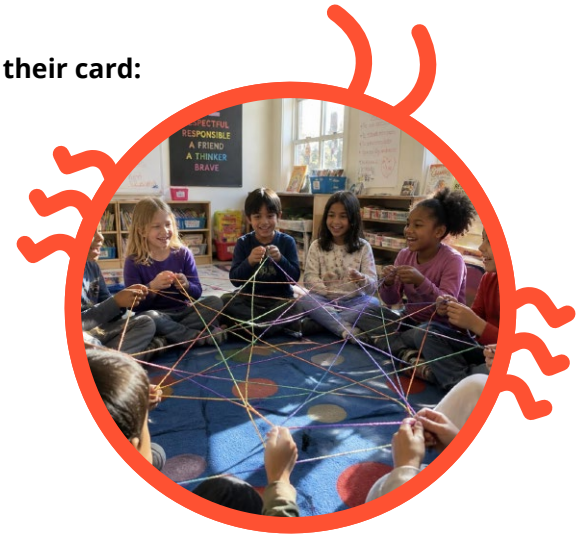
Materials:

- Yarn or rope
- 20-card set

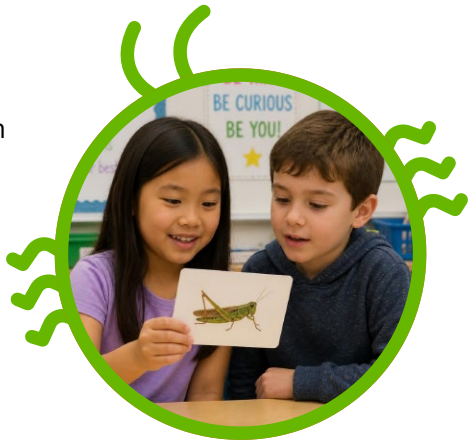
If using with more students consider adding duplicates of: Native Wildflowers, Bumble Bees, Ground Beetles, Songbirds, Leaf Litter. Ecosystems often have many individuals of the same species, and adding more living things creates more connections in the ecosystem web.

1 Meet the ecosystem

- **Teacher introduction:**
  - When we think about animals, we often think about big animals like birds, bears, or whales. But tiny insects and spiders are also a very important part of nature. Insects interact with plants, animals, and their habitats in many ways. Today, we are going to explore how insects are connected to the world around them.
  - A place where living things interact with the things they need (e.g., water and soil) is called an ecosystem. Every part of an ecosystem has a role, including insects.
- **Give each student one ecosystem card.**
- **Students stand in a circle and introduce themselves by reading their card:**
  "I am a bumble bee. My role is to pollinate flowers. I help plants make seeds and fruit."
- **Have students look at their cards and use a show of hands:**
  - Who are living things?
  - Who are not living things?
  - Who are insects?
  - Who thinks they need insects to survive?



2 Connect the web



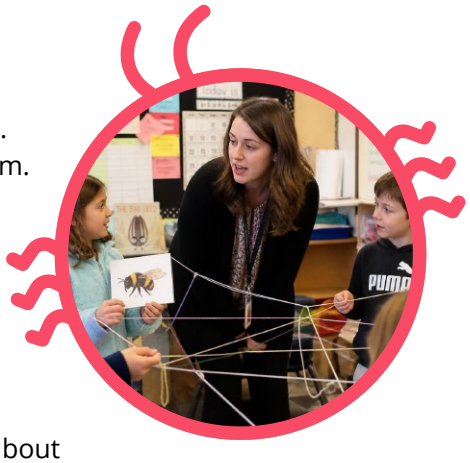
- One student begins by holding the end of the yarn and reading their ecosystem card aloud.
- The teacher asks: “Look at your cards. Who thinks they are connected to this part of the ecosystem?”
- Students raise their hands if they think their card has a relationship or interaction with the card that was just introduced. The teacher tries to select a student who is not already holding the yarn.
- The teacher asks “explain how you think you are connected” and the selected student explains.
- If the class agrees that the connection makes sense, the yarn is passed to that student (with teacher support or by gently tossing the yarn underhand).
- The new student reads their card aloud, and the teacher asks the class the same question. As more connections are discovered, the ecosystem web continues to grow.
- Continue until the class has built a web of connections.

3 Introduce biodiversity

- **After the web is built, ask:**
  - "How many different kinds of living things are connected to insects?"
  - "What roles do insects have in this web?"
  - "Would this web look different without insects?"
- **Then introduce:**

> "**Biodiversity** means having many different kinds of living things in an environment. Insects are an important part of biodiversity because they have many different roles and connect with many other species."

4 Remove the insects



- After building the web, explore what happens when different insects disappear. This helps students see that different insects play different roles in an ecosystem.

- **Remove a bumble bee**

  - The teacher prompts: “Imagine all the bumble bees disappeared from this ecosystem.”
  - The bumble bee student(s) gently pull on their yarn connections.
  - The teacher asks: Who felt their yarn move or pull?” “What does that tell us about how you are connected to bumble bees?”
  - Students raise their hands if they are connected to the bumble bee and explain how their card is affected. The teacher prompts: “Now let’s see who might be indirectly affected.”
  - Students who are connected to the bumble bee gently pull on their own yarn connections to show how changes can spread through the web.
  - The teacher asks:
    - "Who was affected, even though they weren't connected directly to the bumble bee?"
    - “How did the loss of one insect create changes for other parts of the ecosystem?”

- **Repeat the same process with other insect cards, such as:**

  - Ground beetle: What changes when an insect that helps recycle nutrients disappears?
  - Lady beetle: What changes when an insect that helps control pests disappears?
  - Butterfly: What changes when an insect that helps pollinate plants disappears?
  - Continue with as many insects as time allows.

5 Discussion Questions

- **After exploring multiple insects, ask:**

  - Did every insect have the same role in the ecosystem?
  - How were the connections different for bees, beetles, and butterflies?
  - Why is it important to have many different kinds of insects?
  - What did we learn about how insects contribute to biodiversity?
  - How might losing many different insects affect an ecosystem?

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Making Connections

Explain:

- Scientists can't protect something if they don't know it exists. That's why researchers across Canada are working with schools through **BugQuest.**
- Students help collect insects from their schoolyards, and scientists use **DNA** (i.e., a special code found inside living things) to identify the different species. Together, everyone is helping build a better understanding of Canada's biodiversity.

Ask:

- Why might scientists want to know which insects live in different places?
- How can this information help us understand and protect nature?

Teacher Notes

This lesson introduces biodiversity through the familiar topic of insects rather than presenting biodiversity as an abstract concept. Students first develop an appreciation for the important roles insects play before connecting those roles to the idea that ecosystems are healthiest when they include many different species. BugQuest then provides an authentic opportunity for students to participate in community science and contribute to real biodiversity research.

Vocabulary

Herbivore	An animal that eats only plants.
Pollinator	An animal, such as a bee or butterfly, that moves pollen from one flower to another so plants can make seeds and fruit.
Nutrient Recycling	The process of returning nutrients from dead plants and animals back into the soil so new life can grow.
Nectar	A sweet liquid made by flowers that attracts pollinators like bees, butterflies, and hummingbirds.
Decomposer	A living thing, such as a fungus, worm, or some insects, that breaks down dead plants and animals and returns nutrients to the soil.
Wetland	An area where the land is covered by shallow water for all or part of the year. Wetlands provide habitat for many plants and animals.
Predator	An animal that hunts and eats other animals for food.
Pollen	A fine powder made by flowers that is needed for plants to make seeds.
Biodiversity	The variety of living things, including plants, animals, fungi, and other organisms, in an area.
Ecosystem	A community of living things and their environment, all interacting with one another.
Insects	Animals with six legs, three body parts (head, thorax, and abdomen), and usually one or two pairs of wings.

Extensions

Science	• Observe insects around your school using the provided magnifying glasses. Record where you find them, what they are doing, and what habitat they are using. • Observe a live insect in a classroom bug enclosure for several days before releasing it where it was found. Record its appearance, behaviour, movement, and interactions with its habitat. How does it eat? Where does it spend its time? What role do you think it plays in the ecosystem?
Math	• Create a graph showing the number of different insects observed during a schoolyard walk.
Language	• Write from the perspective of an insect living in your schoolyard. Describe your daily challenges and the important roles you do. • Create a collective zine to share your learning with the school community
Art	• Create an "Unsung Heroes" poster highlighting one insect and its role in the ecosystem. • Transform the ecosystem web into an art installation. Using yarn and other materials, students create a visual representation of the connections between insects, plants, animals, and their habitats. The artwork shows how even small creatures play important roles in keeping ecosystems healthy.
STEAM / Engineering	• Build a mini insect habitat using natural materials that provides food, water, and shelter for a chosen insect. Explain how your design meets the insect's needs.
Technology	• Create a short video, slideshow, or digital field guide introducing your adopted insect and explaining why it is important to biodiversity.
Drama	• Work in small groups to create a short skit showing what might happen if one type of insect disappeared from an ecosystem.

Bumble Bee

My Role: **Pollinator**

I need:
- Flowers for nectar and pollen
- Safe places to nest

Others need me because:
- I help many plants make seeds and fruit
- I am food for birds and other animals

I connect most to:
- Wildflowers
- Trees
- Garden Plants
- Songbird

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Monarch Butterfly

My Role: **Pollinator**

I need:
- Milkweed to lay my eggs
- Flowers for nectar

Others need me because:
- I help pollinate flowers
- I am food for birds and other wildlife

I connect most to:
- Native Wildflowers
- Songbird

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Lady Bug

My Role: **Predator**

I need:
- Aphids and other tiny insects

Others need me because:
- I help keep aphid populations under control
- I am food for birds

I connect most to:
- Songbird
- Garden Plants

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Spider

My Role: **Predator**

I need:
- Insects to catch

Others need me because:
- I help control insect populations
- I am food for birds

I connect most to:
- Songbird
- Bumble Bee
- Moth
- Grasshopper

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Ground Beetle

My Role: **Predator and Recycler**

I need:
- Leaf litter
- Small insects
- Healthy soil

Others need me because:
- I eat pests
- I help return nutrients to the soil

I connect most to:
- Leaf Litter
- Fungi
- Healthy Soil
- Garden Plants

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Ant

My Role: **Soil Helper**

I need:
- Soil
- Seeds and small insects

Others need me because:
- I move seeds
- I help mix and aerate the soil

I connect most to:
- Healthy Soil
- Native Wildflowers
- Leaf Litter

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Dragonfly

My Role: **Predator**

I need:
- Clean water
- Reeds and lily pads

Others need me because:
- I eat mosquitoes and other insects
- I am food for frogs and birds

I connect most to:
- Clean Water
- Reeds and Lily Pads
- Songbird
- Frog

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Grasshopper

My Role: **Herbivore**

I need:
- Leaves and grasses to eat
- Plants for shelter

Others need me because:
- I help move energy from plants to animals.
- I am an important food source for birds, frogs, and other wildlife.

I connect most to:
- Garden Plants
- Native Wildflowers
- Songbird
- Frog

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Moth

My Role: **Night Pollinator**

I need:
- Flowers
- Trees and shrubs

Others need me because:
- I pollinate flowers at night
- I am an important food source for bats

I connect most to:
- Trees
- Native Wildflowers
- Bat

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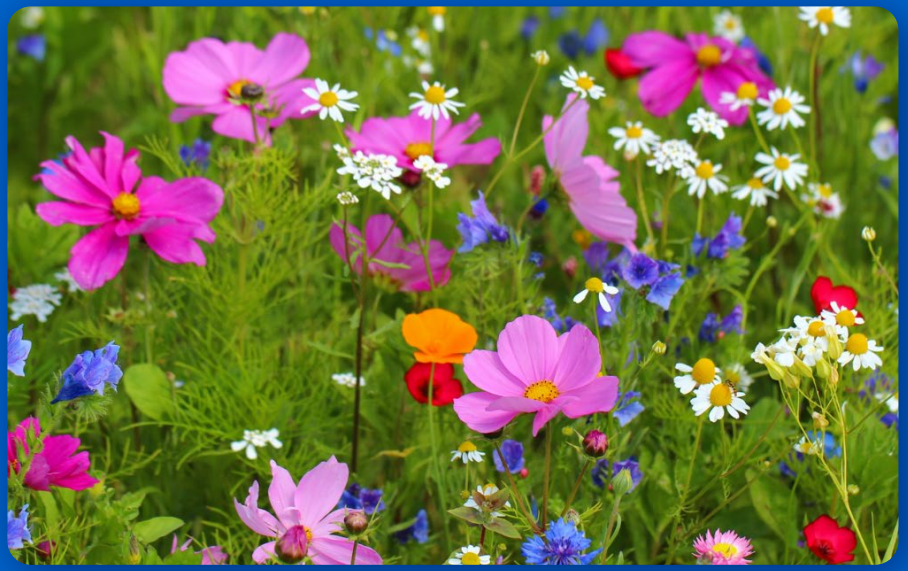
Native Wildflowers

My Role: **Flowering Plant**

I need:
- Healthy soil
- Water
- Pollinators

Others need me because:
- I provide nectar and pollen
- I make seeds for wildlife

I connect most to:
- Bumble Bee
- Moth
- Monarch Butterfly
- Healthy Soil



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Trees

My Role: **Habitat Provider**

I need:
- Healthy soil
- Water

Others need me because:
- I provide homes for insects and birds
- I produce seeds and leaves

I connect most to:
- Songbird
- Bat
- Squirrel
- Fungi

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Garden Plants

My Role: **Food Producer**

I need:
- Healthy soil
- Water
- Pollinators

Others need me because:
- I grow fruits and vegetables
- I provide food for people and wildlife

I connect most to:
- Bumble Bee
- Healthy Soil
- Lady Beetle

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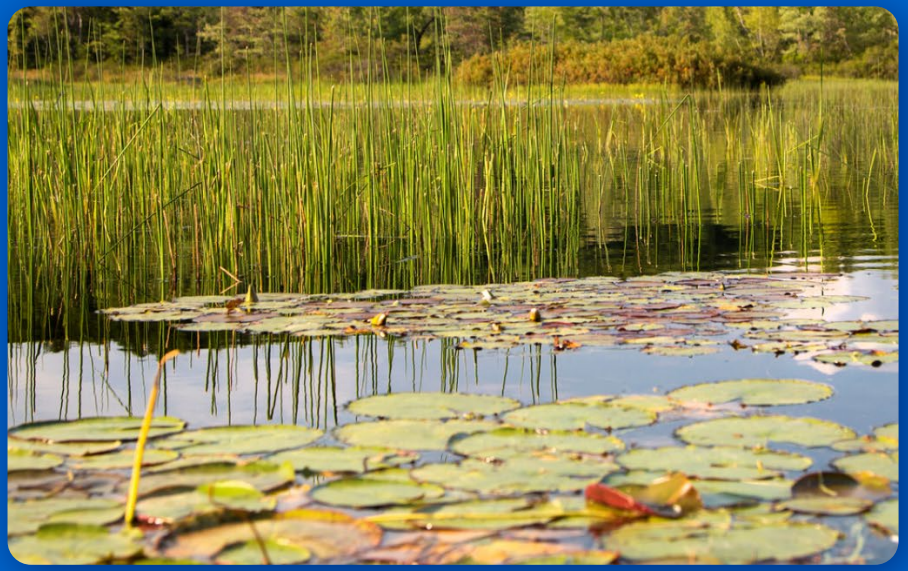
Reeds and Lily Pads

My Role: **Wetland Habitat**

I need:
- Clean water

Others need me because:
- I provide shelter for insects and frogs
- I protect the edges of ponds

I connect most to:
- Dragonfly
- Clean Water
- Frog



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Songbird

My Role: **Insect Eater**

I need:
- Trees for nesting
- Insects for food

Others need me because:
- I help keep insect populations balanced
- I spread some seeds

I connect most to:
- Lady Beetle
- Monarch Butterfly
- Tree
- Bumble Bee
- Ground Beetle

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Frog

My Role: **Insect Eater**

I need:
- Clean water
- Insects
- Reeds and lily pads

Others need me because:
- I help control insect populations
- I am food for larger animals

I connect most to:
- Dragonfly
- Reeds and Lily Pads
- Clean Water

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Bat

My Role: **Night Hunter**

I need:
- Trees or buildings to roost
- Flying insects

Others need me because:
- I eat many moths and mosquitoes each night.

I connect most to:
- Moth
- Trees

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Fungi

My Role: **Decomposer**

I need:
- Dead plants and animals
- Moist places

Others need me because:
- I recycle nutrients back into the soil.

I connect most to:
- Healthy Soil
- Leaf Litter
- Trees
- Ground Beetle

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Leaf Litter

My Role: **Habitat**

I need:
- Fallen leaves and plants

Others need me because:
- I provide shelter for insects
- I slowly become part of the soil

I connect most to:
- Fungi
- Ground Beetle
- Ant

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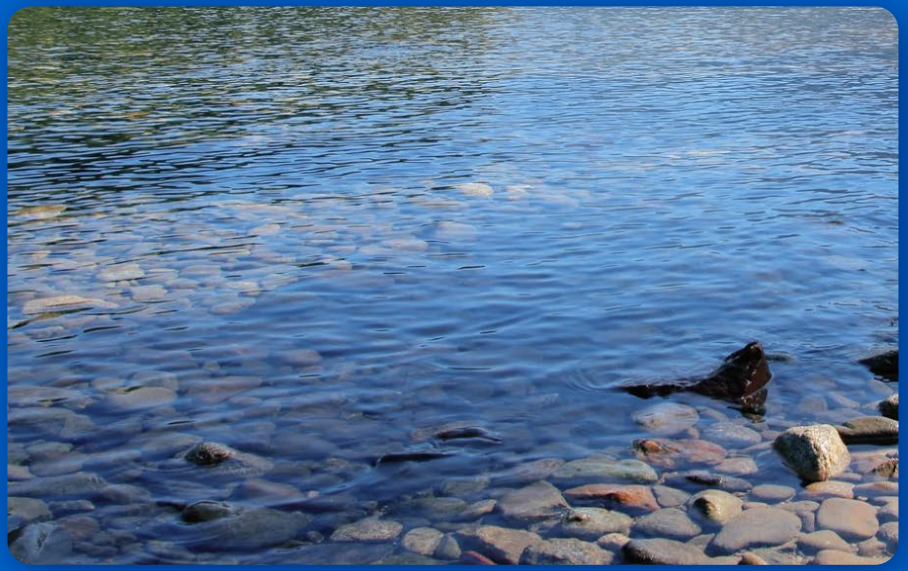
Clean Water

My Role: **Habitat**

I need:
- Healthy streams and ponds

Others need me because:
- I support aquatic insects and frogs

I connect most to:
- Dragonfly
- Reeds and Lily Pads
- Frog



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Healthy Soil

My Role: **Support Life**

I need:
- Decomposers
- Water
- Organic matter

Others need me because:
- I help plants grow
- I provide homes for many insects

I connect most to:
- Fungi
- Trees
- Ground Beetle
- Ant
- Garden Plants
- Native Wildflowers

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