

Schoolyard Bioblitz Education Kit



For Grades K-5

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Introduction to the Schoolyard Bioblitz Education Kit

About the Kit

- Welcome to the Schoolyard Bioblitz Education Kit! This education kit is intended to be a step-by-step resource on how to incorporate bioblitzes into your teaching curriculum. The kit is meant to compliment the documentary film *Every Living Thing: Experiencing a Bioblitz*.
 - **Film link:** <https://curio.ca/en/video/every-living-thing-experiencing-a-bioblitz-10566/>
 - **Note:** we recommend that teachers preview this film before showing it to their class to ensure that terminology and content is appropriate for your grade level.
(Recommended for ages 14+)
- The activities in this kit will help you introduce concepts of biodiversity, plan and hold your own bioblitz in the schoolyard, encourage greater understanding and appreciation of local plants and animals, and introduce different scientific career opportunities to your students.
- **The kit is written primarily for New Brunswick teachers, but the activities are applicable to curricula across Canada.** The information and activities in this kit are tailored to the elementary school level, with specific curriculum links listed for each activity (as per the *Atlantic Canada Science Curriculum, 2002*). Kits are also available for the middle school and high school levels.
- The information and activities in this kit are organized for you to use easily. Each section focuses on a different step of planning and holding a bioblitz, and activities cater to a variety of different learning styles. You can pick and choose the activities that fit best with your curriculum, or you can complete all the activities in the kit for the full bioblitz experience!

About Nature NB

- Nature NB is a non-profit, charitable organization whose mission is to celebrate, conserve and protect New Brunswick's natural heritage, through education, networking and collaboration. Founded in 1972 as the New Brunswick Federation of Naturalists, the organization is presently comprised of a dozen naturalist clubs and hundreds of members across the province.
- In addition to encouraging a better understanding of the natural environment and awakening concern for our province's natural heritage, Nature NB recognizes the importance of actions to preserve and maintain that natural heritage. We achieve both through various programs for youth and adults, and through the development of educational materials.

Acknowledgements

This kit was made possible with contributions from:

- Natural Sciences and Engineering Research Council of Canada
- New Brunswick Wildlife Trust Fund
- Canadian Wildlife Federation

Thanks to committees and others:

- Review committee
- Atlantic Canada Conservation Data Centre
- CBC Curio



SECTION 1 Introducing concepts

1.1

What is Biodiversity?

- **Biodiversity** (biological + diversity) refers to the wide variety of life on earth and all the ways that different living things interact with each other.

1.2

Why is Biodiversity important?

- Biodiversity is important because we **depend on it to survive**, as do other living things. As humans, we rely on a wide variety of living things that we might eat as food, use for medicine, or turn into clothes or shelter.
 - Other living things do this too; for example, a bird might eat earthworms and berries, and build a nest in a tree using twigs, grasses, and lichens. A mushroom might find its home in a safe spot at the base of a tree and eat the leaves that fall from it.
 - When there are lots of things to eat, or lots of places to find shelter and build homes, there is more space for more living things to find what they need to survive.
- The diversity of life – which includes differences in genes, in species, and in ecosystems – also helps living things **respond to environmental changes**.
 - Ecosystems that are diverse can recover from change more easily than those that are not. If an environment changes and something within an ecosystem is lost, living things in a diverse ecosystem can more easily replace what was lost.
 - For example, if birds living in a diverse forest suddenly lost the blackflies that they eat, they could easily find another food to eat instead, like houseflies or beetles or caterpillars or berries.
 - If their environment was not diverse – if blackflies were the only food available to the birds – then they would not be able to find another food to eat, and the birds would also die.

Biodiversity supports us, and also helps us continue to survive in the face of a changing environment.

What is a Bioblitz?

Definition and Purpose

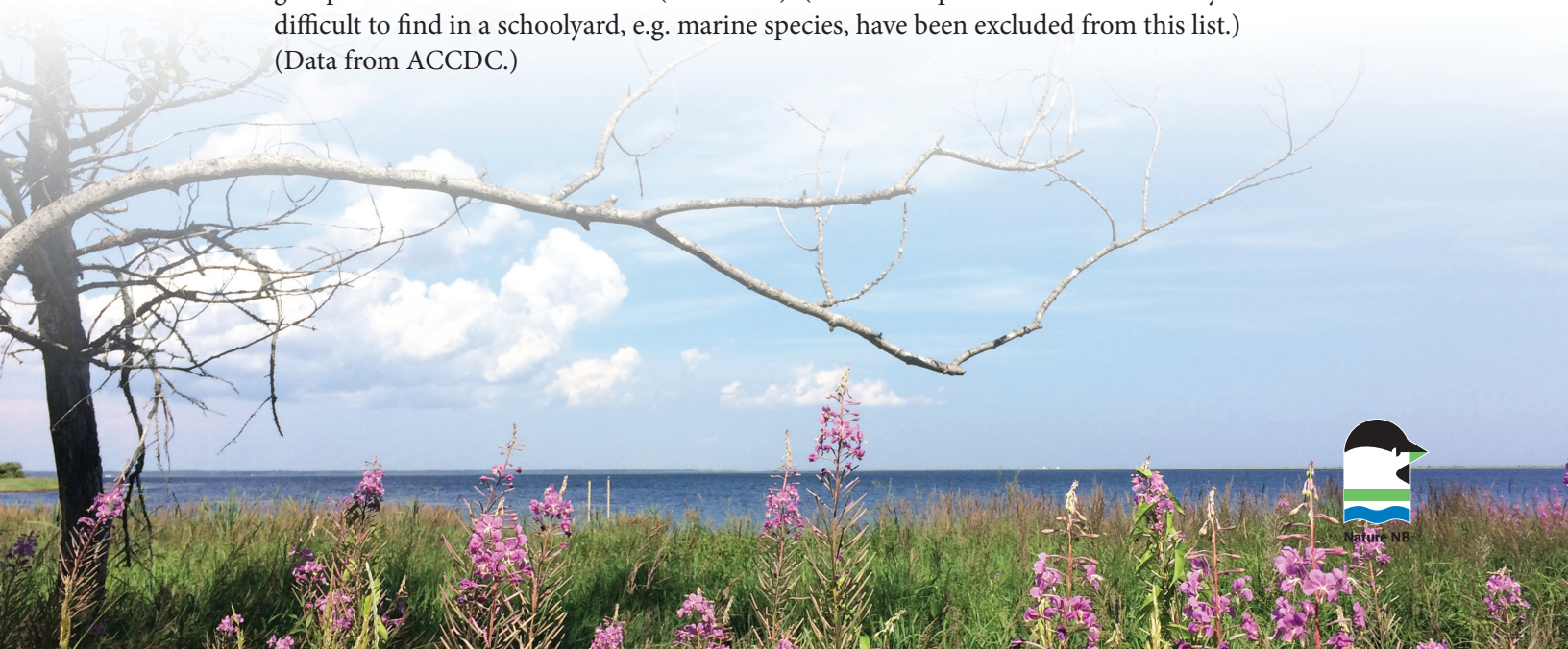
- A **bioblitz** is a fun activity that helps you find and understand the biodiversity near you.
- A bioblitz is done over a set period of time (e.g. 1 day) in a specific area (e.g. your schoolyard) to find, identify, and record all of the organisms that live within the area. A bioblitz can provide you with a “snapshot” of the biodiversity found in your area.

Importance

- A bioblitz is an important scientific tool of discovery that can reveal valuable information about the biodiversity in your area. Even a relatively small bioblitz can find preliminary information that can be used for larger-scale research. Over the years, bioblitzes in New Brunswick have led to the discovery of several species not previously recorded in the province!
- Using bioblitzes to help us understand the biodiversity in an area helps us to protect species at risk, manage resources and land that are used by living things, and monitor climate change and its effects on biodiversity.

Biodiversity in New Brunswick

- There are estimated to be over 33,000 unique species that live here in New Brunswick.
- To help illustrate the diversity of species in New Brunswick, we can group the species that live here into 10 major categories, called **taxonomic groups**. Taxonomic groups are categories of organisms that are closely related and therefore share certain characteristics.
- For each taxonomic group (below), you will find the characteristics that define the group, species that are examples of the group, and estimates of the number of species within the group that live in New Brunswick (as of 2017). (Note: Groups that would be unlikely or difficult to find in a schoolyard, e.g. marine species, have been excluded from this list.) (Data from ACCDC.)



Vascular Plants



- Vascular plants are terrestrial plants that have special tissues (like a circulatory system) that help transport water and sugars throughout the plant.
- Examples of vascular plants include ferns, trees, and flowering plants.
- Mosses and algae are non-vascular plants and do not have a “circulatory system”.
- 1827 species: 1315 **native species** that have evolved in and always lived in New Brunswick; 612 exotic or potentially exotic species that people brought to New Brunswick from somewhere else and planted here.



Fungi



- Fungi are completely different than plants or animals. Fungi can't make their own food and have to absorb nutrients from other organisms. To do this, many fungi break down other organisms into molecules the fungi can absorb. This act of **decomposition** is very important to our ecosystems!
- Examples of fungi include yeast, mould, and mushrooms, though without a microscope you would be most likely to find mushrooms in a New Brunswick schoolyard.
- 808 species.



Terrestrial Mollusks



- Mollusks are **invertebrate** (no backbone) animals that generally have a shell, a muscular “foot”, and specialized organ systems for breathing and eating. Some mollusks live on the land (terrestrial mollusks) and some live in the ocean (marine mollusks).
- Examples of terrestrial mollusks include snails and slugs. (Examples of marine mollusks include conch, squid, octopus, clams, oysters, scallops, and mussels.)
- 123 terrestrial species (number of marine mollusk species is currently unknown).





Arachnids

- Arachnids are invertebrate (no backbone) animals with eight legs. They do not have antennae or wings, like insects do. The only type of arachnid that lives in New Brunswick is spiders.
- Examples of arachnids include crab spiders, cellar spiders, and orb-weaver spiders.
- 392 species confirmed, but is probably a significant underestimate of what is actually here but undocumented.



Insects

- Insects are invertebrate (no backbone) animals with three body segments, six legs, antennae, and an **exoskeleton**. Adult insects typically have two pairs of wings (e.g. butterflies), but certain groups of insects use one or both pairs of wings to do something other than flying (e.g. beetles use one pair of wings like a protective “shell”). Most insects hatch from eggs, go through several stages of growth as a larva or nymph, and may undergo **metamorphosis** before developing their adult body. Insects are the most diverse group of animals in the world.
- Examples of insects include beetles, flies, dragonflies, butterflies, moths, bees, wasps, ants, mayflies, grasshoppers, caddisflies, mosquitoes, crickets, and leaf hoppers.
- 5658 insect species confirmed, but that doesn't include thousands of species that would be here but are not yet documented.



Freshwater Fish

- Freshwater fish are vertebrate (have a backbone) animals that spend the majority of their lives in fresh water, like rivers and lakes, as opposed to salt water. These fish are ray-finned, bony fish, meaning that their skeleton is made of bone (as opposed to cartilage) and their fins get their structure and support from spoke-like bones (“rays”) in the fin.
- Examples of freshwater fish include trout, bass, and salmon (during their breeding season and early life).
- 49 species.



Amphibians



- Amphibians are vertebrate (have a backbone) animals that spend part of their life living in the water, and part of their life living on land. They typically spend their early life in the water, breathing with gills, and then undergo a metamorphosis to develop lungs and other features to help them live on land. Many amphibians also have thin skin, covered with a layer of mucous, that they can breathe through while on land!
- Examples of amphibians include frogs, toads, and salamanders.
- 16 species.



Reptiles



- Reptiles are vertebrate (have a backbone) animals that live on land. Their exposed skin is covered in scales and is waterproof. Because the skin is so tough, it can't stretch as a reptile's body grows, so reptiles need to shed their skins periodically throughout their life.
- Examples of reptiles include turtles and snakes.
- 8 species (including 2 sea turtles only present offshore).





Birds

- Birds are vertebrate (have a backbone) animals that have feathers and beaks. Their feathers and wings allow most birds to be able to fly. Birds can live in a variety of habitats, from forests to mountains to ocean, and many birds migrate between habitats twice a year.
- Examples of birds include chickadees, sparrows, warblers, finches, gulls, crows, hawks, owls, thrushes, ducks, geese, hummingbirds, grouses, cranes, sandpipers, and woodpeckers.
- 410 species (258 live in New Brunswick year-round or migrate to New Brunswick for part of the year; the remainder are rare vagrants that are in New Brunswick temporarily and accidentally, for example if they were blown here by a storm.)



Mammals

- Mammals are vertebrate (have a backbone) animals with hair that feed their babies with milk. Mammals can live on land or at sea.
- Examples of mammals include mice, rats, squirrels, bats, shrews, hares, coyotes, bobcats, foxes, raccoons, seals and whales.
- 76 species (including whales only present offshore).



ACTIVITY 1

A Spaceship for Species



- ▶ Students will help label a graph illustrating the number of species in New Brunswick and will describe characteristics of different types of organisms.

MATERIALS



Taxonomic group icons (included at the end of this activity), magnets or tape for attaching images.

LOCATION



Indoors.

TIME REQUIRED



40 minutes.

CURRICULUM LINKS

- **Grade 4 Science: Unit 1 – Life science: Habitats 300-1:** Compare the external features and behavioural patterns of animals that help them thrive in different kinds of places.
- **Grade 4 Science: Unit 1 – Life science: Habitats 300-2:** Compare the structural features of plants that enable them to thrive in different kinds of places.
- **Grade 4 Science: Unit 1 – Life science: Habitats 301-1:** Predict how the removal of a plant or animal population affects the rest of the community.
- **Grade 4 Science: Unit 1 – Life science: Habitats 301-2:** Relate habitat loss to the endangerment or extinction of plants and animals.

KEY TERMS

- **Taxonomic group:** a category of living things that are closely related and therefore share certain characteristics.
- **Species:** a group of organisms that is unique or different from all other groups.

BACKGROUND INFORMATION

- See section 1.1 for background info on biodiversity.
- See section 1.4 for information about biodiversity in NB.

INSTRUCTIONS

- 1** Review the concept of biodiversity using background information from section 1.1.
- 2** Make up a story about gathering all the species of New Brunswick, or use the following storyline:

Imagine yourself as a scientist in the future. Humans are beginning to colonize other planets and you and your team are tasked with preparing a spaceship that will transport all the species of New Brunswick to a new world, called New New Brunswick. The inside of the spaceship is designed to be a perfect replica of New Brunswick habitat. It is now your job to fill the spaceship with all the living organisms in New Brunswick. Before you can fill your “Spaceship for Species”, you need to learn about all the different species that will live on board.
- 3** Have 10 students come to the front of the class and have each student represent one of the 10 major groups of organisms (see background information in section 1.4). Give each student a taxonomic group name (bird, fish, reptile, etc.). Differentiate each of the groups by asking students to name the characteristics of the group. Use the taxonomic group icons provided to help students understand what the group represents. Examples of the characteristics of each group are given in section 1.4.
- 4** Place the taxonomic group icons on the board and ask the students to vote for the group that they think has the highest number of unique species. Be sure to explain the difference between species and individuals – for example: students are being asked how many different kinds of birds live in NB (e.g. robins, crows, blue jays = 3 species), rather than the total number of individual robins, crows, and blue jays that live in NB (many thousands!).
- 5** Ask students to vote for the group that has the second highest number of unique species. You may want to arrange the group icons along the board as students vote, from “highest number of species” to “lowest number of species”. Continue voting until all icons have been considered by the students.
- 6** Ask the students to guess the total number of species that live in New Brunswick for each of the groups. Write this number of species beside each group icon.
- 7** Using the information provided in section 1.4, write the known total number of species for each group next to the students’ estimates. Draw a bar graph to better illustrate the difference in number of species.

Example scale for bar graph (1 cm = 40 species):



EXAMPLE SCALE FOR BAR GRAPH (1 cm = 40 species)

Taxonomic group	Number of species	Scale (cm)	Rank (by # of species)
Plants	1827	45.7	2
Fungi	808	20.2	3
Mollusks	123	3.1	6
Arachnids	392	9.8	5
Insects	5658	141.5	1
Freshwater Fish	49	1.2	8
Amphibians	16	0.4	9
Reptiles	8	0.2	10
Birds	410	10.3	4
Mammals	76	1.9	7

Discussion questions

- **Did the number of species in any particular category surprise you? Why?**
For example, students may be surprised by how many invertebrate species there are (mollusks, insects, and arachnids).
- **Why are there so many more species of invertebrate animals (mollusks, insects, arachnids) than vertebrate animals (fish, amphibians, reptiles, birds, and mammals)?**
- **What habitat features does New New Brunswick (the newly colonized world) need to have for these organisms to be able to live there comfortably?** You may want to discuss each group of organisms individually, or assign a different group of organisms to pairs (or groups) of students and ask them to discuss among themselves.
- **What would happen if you forgot to bring some New Brunswick species on your spaceship to New New Brunswick? What would happen if you forgot to bring a whole group of species (e.g. fungi or insects) on your spaceship?**

- The new world of New New Brunswick is a little bit different from your world. It is in a different solar system, and despite your best efforts to recreate New Brunswick habitat, some things are different. **How might changes in habitat affect the organisms you brought to New New Brunswick?** (Feel free to be more specific about how the habitat is different. Maybe the sun is hotter, or maybe the seasons are longer and there is no winter. Maybe there are no freshwater rivers, or maybe the soil is very dry and sandy, etc.).

Variations/Extensions

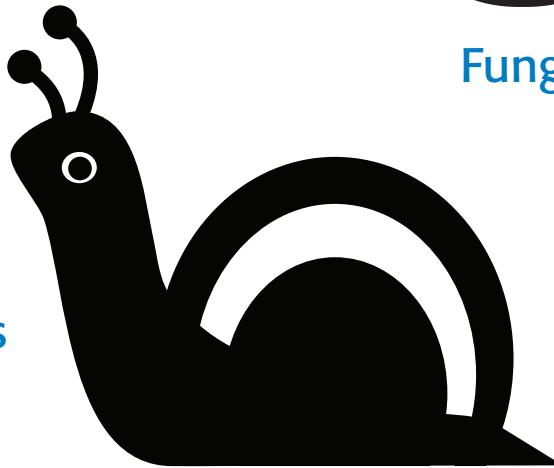
- Have students cut out pictures of living things from magazines or calendars (or prepare photos ahead of time). Ask the students to place the organism picture into the correct group. For example, a picture of a robin would be placed with the bird category and a pine tree would be placed with the plant category.
- Have students add the number of invertebrate animal species together and the number of vertebrate animal species together. Have the students draw a graph to compare the two groups.
- Have students draw a picture of what the inside of the spaceship looks like. Where will they put all the species in the spaceship?
- Have students write a scientist's diary entry describing what happens on the first day in New New Brunswick (the newly colonized world).
- Using the same taxonomic groups as in this activity, ask students to research the number of species in each group in Canada, in North America, and/or in the world, and compare to the information provided for New Brunswick. What aspects of biodiversity are similar or different at these levels? Choose a representative organism from each group that does not live in New Brunswick, and compare it to an organism that does live in New Brunswick. How are they similar or different?

Plants

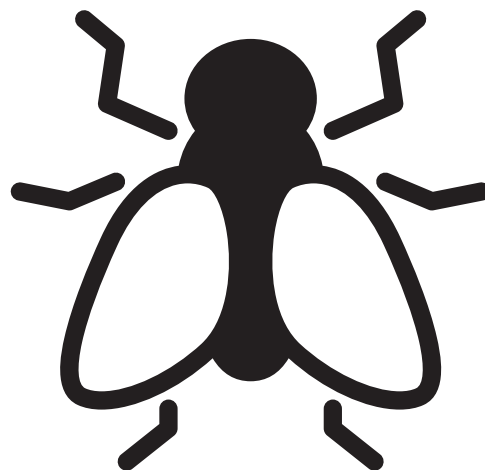


Fungi

Mollusks



Arachnids

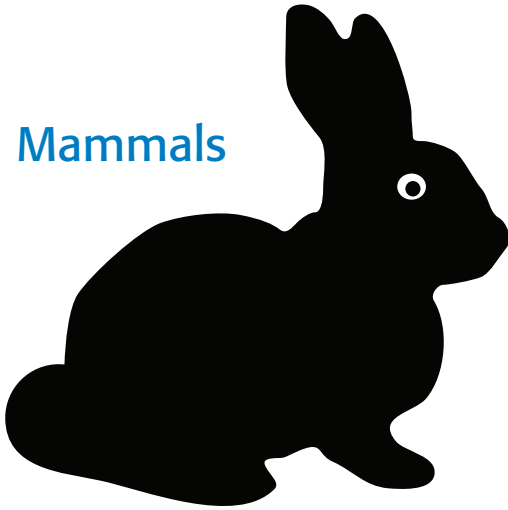


Insects

Birds



Mammals



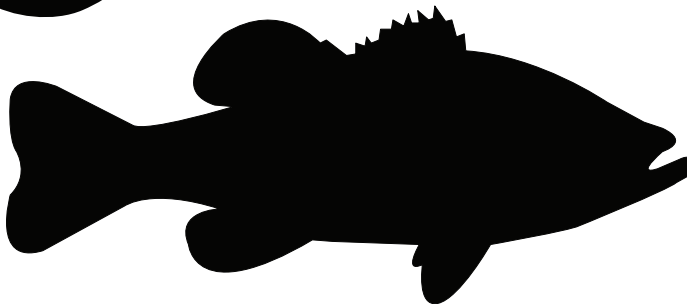
Amphibians



Reptiles



Freshwater Fish



ACTIVITY 2

The Mystery Envelope

► A mysterious envelope is delivered at the start of the class and is opened by the teacher. Students follow the directions in the envelope to solve the mystery. They must decode word clues to reveal the mystery word.

MATERIALS  Student worksheet, pens or pencils.

LOCATION  Indoors.

TIME REQUIRED  40 minutes.

CURRICULUM LINKS

- **Grade 4 Science: Unit 1 – Life science: Habitats 104-6:** Demonstrate that specific terminology is used in science contexts.

KEY TERMS

- **Biodiversity:** the wide variety of life on earth and all the ways that different living things interact with each other.
- **Habitat:** where an animal or plant lives, including the food and shelter it needs to survive and the climate to which it is adapted.

BACKGROUND INFORMATION

- See section 1.1 for background info on biodiversity.
- See section 2.1 for background info on habitat.
- See section 1.4 for background information on biodiversity in New Brunswick.



INSTRUCTIONS

- 1 Present the background information to the class and discuss.
- 2 Before class starts, arrange to have the mystery envelope delivered to the class. The envelope should contain the letter below.
- 3 When the envelope arrives, open it and read the letter:

Dear Teacher: I am writing to you on behalf of the NB Private Investigator Federation Inc. Our team of agents has been trying to break a secret code with no success. Since your students are learning about the variety of life on Earth, it was suggested they might have some information that would assist us in cracking the case. As a last resort, we are turning the case over for you to solve.

Mr/s _____ class has been selected to undertake an important mission. There are certain questions that must be answered to break the code and reveal a mystery word that is somehow connected to species-at-risk in the province of NB. To solve the questions, the students must determine the answer to each question, and write it in the space provided. Our secret agents suggest that the letters found in the box for each answer should help you discover the mystery word.

Yours truly,

Secret Agent
NB Private Investigator Federation Inc.

- 4 Give each student a worksheet to complete (previously photocopied and placed in the envelope). This is best suited to students working individually, but also can be done easily as a group. Once the activity is over, review the words and other related words, and give their definitions.
- 5 After students have completed the worksheet, go over the answers and discuss the following:
 - i. How does the mystery word relate to the topic of biodiversity?
 - Ex: Habitat loss affects the amount of biodiversity.
 - Ex: The number of species (e.g. biodiversity) depends on the type of habitat: think of a rainforest VS a desert.
 - ii. Why is it important to protect habitat?
 - iii. How can we ensure that we protect habitat?

ANSWERS

1. Fish
2. Fungi
3. Plants
4. Invertebrates
5. Mammals
6. Amphibians
7. Reptiles
8. Birds

MYSTERY WORD Habitats



1.6

MYSTERY ENVELOPE WORKSHEET

Choose one of these words and place it in the appropriate place:

amphibians fungi plants	birds invertebrates reptiles	fish mammals
-------------------------------	------------------------------------	-----------------

1. These are cold-blooded animals that spend their lives in the water.

___ ___ ___

2. Examples of organisms in this category are molds, yeast, and mushrooms.

___ ___ ___ ___

3. These organisms use energy from sunlight to make their own food.

___ ___ ___ ___ ___

4. An animal that does not have a backbone is part of this category.

___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

5. These organisms nourish their babies with milk.

___ ___ ___ ___ ___

6. These animals have gills as juveniles and lungs as adults.

___ ___ ___ ___ ___ ___ ___ ___

7. Turtles are in this category.

___ ___ ___ ___ ___ ___

8. A unique feature of these animals is the presence of feathers.

___ ___ ___

Discover the Mystery Word

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
1	2	3	4	5	6	7	8

SECTION 2 Planning Your Bioblitz

Background Information

- An important step in planning your bioblitz is deciding where in your schoolyard or neighbourhood to focus your observation efforts. Do you want to survey the whole schoolyard to find out what lives there? Are there special areas in the schoolyard that might have unique organisms living there? To help you decide where to start, think about the different habitat types you might have nearby.
- **Habitat** is simply where an animal or plant lives – its home. A habitat is more than just a geographical place; it includes the food and shelter without which a species would not survive, as well as the climate to which it is adapted.
- Having access to suitable habitat is the single most important requirement for any species, including humans. Generally we think of habitat as being made up of four main components: **food, water, shelter, and space**. It is important to note that these components must be arranged properly and be available in large enough quantities to support a species. For instance, many animals need food that is in close proximity to their shelter, to reduce their exposure to predation or severe weather.
- The idea of food, water, shelter, and space may be easier to apply to animals, but it does apply to plants as well. For example, does a plant obtain its energy or ‘food’ from the sun, or does it rely on another plant or fungus to provide nutrients? Does the plant grow on well-drained dry soils, or does it occupy wet areas such as marshes, wetlands or shorelines? With regard to shelter, does the plant live under the protection of a canopy of trees or does it grow in exposed areas? Does it live on north-facing slopes, to avoid full sunlight?
- What makes a “good” habitat varies from species to species, and the needs of a species may change according to its maturity or the season. One thing remains constant: if an organism does not have access to the right habitat, in the right arrangement, and in large enough quantities, it simply will not survive.
- The type of habitat available in an area can often help predict the kind of organisms that will live there. For example, if you have a pond in your schoolyard, you would expect to find organisms that love wet habitats, like frogs or cattails. Understanding the different types of habitats present in your schoolyard will help you be able to predict the kind of organisms you might find there, as well as the number of organisms that might be able to live there.



ACTIVITY 3

Map the schoolyard

- ▶ Students will create a map of the schoolyard and outline different habitat types present in the yard. Students will make predictions about what kind of organisms live in these habitat types and what they might find during their bioblitz.

MATERIALS



Paper, pens or pencils, clipboards, compass (optional), ruler/metre stick/measuring tape (optional).

LOCATION



In-class and outdoors in the schoolyard or neighbourhood.

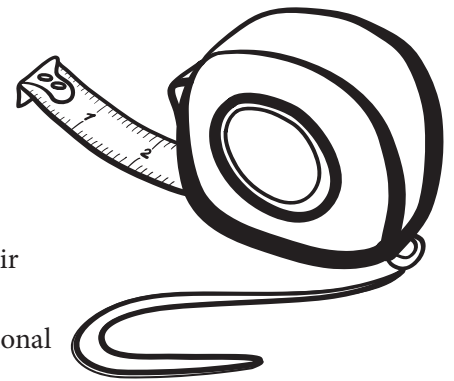
TIME REQUIRED



45 minutes.

CURRICULUM LINKS

- **Kindergarten Unit 4; K4.1:** Describe and locate some of the natural and constructed features of their community.
- **Grade 1 Unit 2; 1.2.1:** Describe how plants and animals meet their needs in a given environment.
- **Grade 4 science Unit 1; 302-1:** Identify a variety of local and regional habitats and their associated populations of plants and animals.
- **Grade 4 science Unit 1; 302-2:** Describe how various animals are able to meet their basic needs in their habitat.



KEY TERMS

- **Bioblitz:** a fun activity that helps you find and understand the biodiversity near you by observing and recording all the living things you find in a specific area.
- **Habitat:** where an animal or plant lives, including the food and shelter it needs to survive and the climate to which it is adapted.
- **Resource:** an object or substance that a living thing needs to survive.

BACKGROUND INFORMATION

- The first step in planning your bioblitz is deciding where in the schoolyard you will focus your observation efforts. Do you want to survey the whole schoolyard to find out what lives there? Are there special areas in the schoolyard that might have unique organisms living there? To help you decide where to start, think about the different habitat types you might have in the schoolyard.
- See section 2.1 on habitat.

INSTRUCTIONS

- 1** Explain to students that they will be investigating the different habitat types present in the school yard, and discuss the background information with them.
- 2** Tell students that they are going to be making a map of the schoolyard and the different habitats that can be found there. Students will be going into the schoolyard, observing the features of the land, and drawing a map that corresponds to the layout of the schoolyard. Students can work individually or as a group.
- 3** Give students a blank sheet of paper, a pencil, and a clipboard or other writing surface that can be used outside.
- 4** Before going outside, discuss and decide as a class what features will be important for students to include on their maps. Does the map need to be to scale, and what should the scale be? Does the map need to include or be accurate to compass direction? Do you want to include man-made features on the map? How should you record things like trees, water, etc.? These details will be important in determining what types of habitat are present in the school yard. Students can draw a general sketch of the yard with general compass directions labelled on the map.
- 5** Go outside with your class! Give them a set amount of time (30-40 minutes; one period) to make observations in the yard and record the details on their maps.
- 6** After students are finished sketching their maps, return to the classroom (or stay outside!) to discuss the maps. What features did they notice in the schoolyard?
- 7** Compare different areas of the schoolyard and discuss how they are similar and different. Try to get students to outline different habitats. E.g., how is a parking lot the same or different from a field? From a forest?

Variations/Extensions

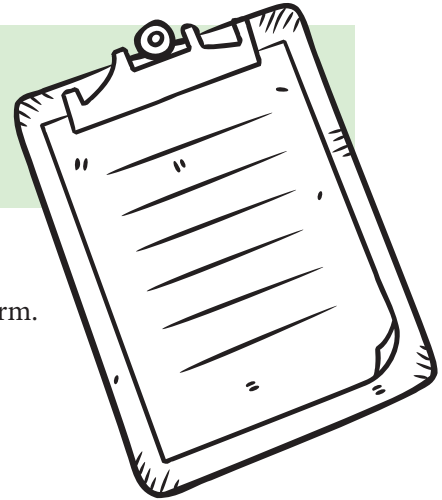
- Name the different habitat types. What general resources exist in each habitat type? What types of organisms might use these resources? E.g. a field has lots of sunlight for flowers, which are food items for insects, which are food items for birds; a parking lot might have garbage cans that can be a food source many animals. Which habitat type(s) could support many different organisms?
- Choose a habitat and two different organisms that might live there (plant and animal). How do these specific organisms find food/water/shelter/space in the habitat? Would they be able to find these things in a different habitat?



ACTIVITY 4

Plan collection method for different taxonomic groups

► Students will learn about different ways to collect data, and will make a plan to collect information during their bioblitz.



MATERIALS



Paper, pencils or pens, brainstorming worksheet, example data collection form.

LOCATION



In the classroom.

TIME REQUIRED



30 minutes.

CURRICULUM LINKS

- **Grade 4 Science: Unit 1 – Life science: Habitats 300-1:** Compare the external features and behavioural patterns of animals that help them thrive in different kinds of places.
- **Grade 4 Science: Unit 1 – Life science: Habitats 300-2:** Compare the structural features of plants that enable them to thrive in different kinds of places.

KEY TERMS

- **Bioblitz:** a fun activity that helps you find and understand the biodiversity near you by observing and recording all the living things you find in a specific area.
- **Observation:** data or information that you collect and record while observing something (using your senses to gather information).
- **Organism:** an individual living thing.
- **Taxonomic group:** a category of living things that are closely related and therefore share certain characteristics.

BACKGROUND INFORMATION

- During a bioblitz, scientists collect detailed observations about the organisms they find in an area. Detailed information about the organism and where it was found can help scientists identify the organism and learn more about it. It’s not always possible for a scientist to find an organism over and over again to make observations about it (especially if they are observing a mobile organism, like a bird or insect), so it’s important for them to write down as much information as possible while they are in the field!

INSTRUCTIONS

- 1 Give students a blank sheet of paper and ask them to sit at their desks. Explain to them that for the next 5 minutes, they will be making observations about their surroundings, and they should write down anything they observe. Students can make observations about anything (e.g. what they see, what they hear, what they smell).
- 2 Start a timer and let the students make their observations.
- 3 When the 5 minute observation period is over, ask students to share a few of their observations. Discuss with students the tools that they used to make these observations (e.g. did they look at them with their eyes? Listen with their ears?), and discuss ways that they could record more details about something they observed (e.g. if you observed a desk, what colour was it? How tall is it? Where is it located relative to other desks?).
- 4 Explain to students that scientists use these observation skills when they are recording information during a bioblitz. Scientists need to record as much information as they can about an organism when they find it in its natural habitat. Now that students have tested their observation skills inside the classroom, they are going to think about what they should observe while doing their bioblitz in the schoolyard.
- 5 Divide the class into small groups. Give each group a copy of the brainstorming worksheet and select one of the following taxonomic groups for them to focus on: Plants, Fungi, Mollusks, Arachnids, Insects, Fish, Amphibians, Reptiles, Birds, Mammals (see section 1.4). Walk through the questions on the worksheet with the class and use an example to help them understand what they are being asked to do, e.g.:
 - Taxonomic group: *Furniture*.
 - Give 3 example organisms for your group: *Desk, chair, bookshelf*.
 - What are some important identifying features that you should record about these organisms? *Colour, dimensions, material*.
 - What are some important features of their habitat that you should record? *Type of room it is found in, exact location in room*.
 - What senses should you use to record these things? *Sight, touch*.
 - Are there any other tools that you could use to record these things? *Ruler, measuring tape*.



- 6** Give students 10-15 minutes to brainstorm and record their ideas on the worksheet. When students are finished, ask each group to present their ideas and ask students if they have additional suggestions. Remind students that the ideas they have presented are going to be things that they will actually be recording in the schoolyard during the bioblitz – if necessary, ask them to help you decide which of their ideas are actually feasible to collect. Decide together which features will be most important to record in the schoolyard.
- 7** Explain to students that scientists prepare forms for themselves to take into their study area, to help them collect all the information they need. Show them the example data form included here. You can use these forms during your bioblitz, or you can ask students to create their own (next step).
- 8** **OPTIONAL** Ask students to return to their groups. After showing them the example data form, ask them to design a form for their assigned taxonomic group that includes all the important pieces of information that they decided on earlier.

BRAINSTORMING WORKSHEET

2.3

Group members:

Taxonomic group (Circle one):

Plants	Insects	Birds
Fungi	Fish	Mammals
Mollusks	Amphibians	
Arachnids	Reptiles	

Give 3 example organisms in your taxonomic group:

Describe your taxonomic group.
How is it similar or different from other taxonomic groups?



2.3

BRAINSTORMING WORKSHEET Continued

What are some important identifying features that you should record about these organisms?

What are some important features of their habitat that you should record?

What senses should you use to record these things? Other than sight, how might you use your other senses to help you identify organisms?

Are there any other tools that you could use to record information during your bioblitz?

EXAMPLE DATA COLLECTION FORM

2.3

Taxonomic Group
Date
Observers (student names)

	At the start of the Bioblitz	At the end of the Bioblitz
Time	_____	_____
Temp (°C)	_____	_____
Cloudy? (yes or no)	_____	_____
Windy? (yes or no)	_____	_____
Precipitation? (yes or no, what type)	_____	_____

Record all the different living things that you find in your sample area that are part of your Taxonomic Group.

If you don't know its name, record it with a drawing instead.

Name or Drawing	Number Found



SECTION 3 Conducting your Bioblitz

3.1

ACTIVITY 5

Conducting your Bioblitz

- ▶ Students will observe organisms in their school yard and record their observations.



MATERIALS



Clipboards, pen or pencil, copies of data sheet, specimen jars, magnifying glass, ruler, flagging tape. Optional: binoculars, insect nets, device with *iNaturalist*.

LOCATION



Outside in school yard or neighbourhood.

TIME REQUIRED



As much as possible – 1 whole period, 45-60 minutes.

CURRICULUM LINKS

- **Grade 1 Unit 2; 1.2.2:** Plan and conduct investigations that explore similarities and differences between plants and animals.
- **Grade 1 Unit 2; 1.2.3:** Observe and describe how living things respond to changes in solar energy that occur on a daily and seasonal cycle.
- **Grade 4 Science: Unit 1 – Life science: Habitats 302-1:** Identify a variety of local and regional habitats and their associated populations of plants and animals.
- **Grade 4 Science: Unit 1 – Life science: Habitats 302-2:** Describe how various animals are able to meet their basic needs in their habitat.
- **Grade 4 Science: Unit 1 – Life science: Habitats 300-1:** Compare the external features and behavioural patterns of animals that help them thrive in different kinds of places.
- **Grade 4 Science: Unit 1 – Life science: Habitats 300-2:** Compare the structural features of plants that enable them to thrive in different kinds of places.

KEY TERMS

- **Bioblitz:** a fun activity that helps you find and understand the biodiversity near you by observing and recording all the living things you find in a specific area.
- **Taxonomic group:** a category of living things that are closely related and therefore share certain characteristics.
- **Organism:** an individual living thing.
- **Observation:** data or information that you collect and record while observing something (using your senses to gather information).

BACKGROUND INFORMATION

- For complete, detailed information on planning and executing a full-scale Bioblitz: http://bioblitzcanada.ca/project_bioblitz-in-a-box.aspx.
- If your classroom is equipped with mobile devices such as laptops or iPads, you might want to consider using a website and App called *iNaturalist*. Using *iNaturalist* is optional, but it can be an excellent resource to have on-hand during the bioblitz. When you take a picture in *iNaturalist* on an iOS device, *iNaturalist* will suggest possible identifications for the organism in the photo. This can help students make correct identifications, in real time. For more information: <https://www.inaturalist.org>.

INSTRUCTIONS

- 1** Before the activity, decide on the area of the schoolyard where you will be making observations with your class. You can mark the area with flag tape or pylons if necessary.
- 2** Prepare your supplies and have them ready for students to grab on their way outside. Each group of students will need: a clipboard, pen or pencil, copy of data sheet, specimen jar, magnifying glass, ruler. Optional: binoculars, insect nets.
- 3** Divide students into groups or teams of 2-3 students. Each group will be responsible for collecting information about one taxonomic group (Plants, Fungi, Mollusks, Arachnids, Insects, Fish, Amphibians, Reptiles, Birds, Mammals).

Note: For guaranteed observation success, these groups will be found easily in your schoolyard:

- **Plants** (trees, flowers, grasses, shrubs)
If your schoolyard is particularly plant-heavy, you can break this assignment into smaller groups (Trees, Flowers, etc.) to make it easier for students to make observations.
- **Fungi** (mushrooms)
- **Mollusks** (slugs, snails)
- **Arachnids** (spiders)
- **Insects** (flies, bees, ants, butterflies, grasshoppers, beetles)
- **Birds** (crows, starlings, robins, gulls)



- 4 Explain to students that you are about to go outside to start your bioblitz! Each group of students will be responsible for collecting information about the taxonomic group they were assigned. For example, if a group is focusing on Trees, they will need to find, observe, and record all the trees they can! Every observation counts – if you see the same kind of organism 5 times, record that you saw it 5 times (e.g. “5 dandelions, 1 rose, 13 daisies”, not “dandelions, roses, daisies”). A tally would be useful here.
- 5 Show students the data collection sheet that they will be using and make sure they understand how to use it. An example sheet is included here; feel free to make your own or have students make their own as per activity 2.4. Explain how other materials (rulers, magnifying glasses, etc.) could be useful to help them collect information.
- 6 Remind students that there are lots of jobs to do within their group! These jobs can include discovering organisms, making and describing observations, taking measurements, taking photos, writing/recording information on a data sheet. Each student can take on a specific role or students can rotate through the different roles.
- 7 Take your students outside and let them explore! This is the main event, so let students explore for as long as your schedule allows; aim for 45-60 minutes or even longer if you can. Encourage students to take lots of notes and photos to help them identify organisms. Students don’t need to identify organisms now if they aren’t able to – with the help of their field notes, they can do this later using extra resources like textbooks, field guides, or online identification guides. The level of observation detail students should focus on is up to you and the goals you need to meet with your curricula.
- 8 **OPTIONAL** During the bioblitz, students can use flag tape to mark any objects that they think are interesting and want to show the rest of the class. During the final 10-15 minutes of your bioblitz, ask students to come together again, and as a class you can take a tour of all the interesting things students flagged.

Variations

- Consider repeating this activity the next day and comparing what was found on Day 1 vs Day 2. You could also repeat the activity at a different time of day, in different weather conditions, or at a different time of year.

SECTION 4 Investigating your findings

ACTIVITY 6

4.1

Visualizing results of the Bioblitz

► In this section, students will categorize and identify organisms they found during their bioblitz. Then students will create graphs to help them visualize the results of their bioblitz. Finish with discussion questions.

MATERIALS



Observations from bioblitz, paper and pencils, field guides or internet resources.

LOCATION

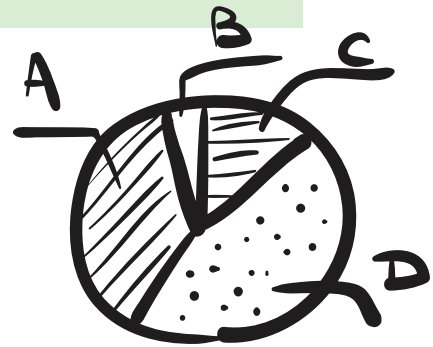


In the classroom.

TIME REQUIRED



60 minutes.



CURRICULUM LINKS

- **Grade 1 Unit 2 1.2.1:** Describe how plants and animals meet their needs in a given environment.
- **Grade 4 Science: Unit 1 – Life science: Habitats 302-2:** Describe how various animals are able to meet their basic needs in their habitat.
- **Grade 4 Science: Unit 1 – Life science: Habitats 300-1:** Compare the external features and behavioural patterns of animals that help them thrive in different kinds of places.
- **Grade 4 Science: Unit 1 – Life science: Habitats 300-2:** Compare the structural features of plants that enable them to thrive in different kinds of places.
- **Grade 4 Science: Unit 1 – Life science: Habitats 301-1:** Predict how the removal of a plant or animal population affects the rest of the community.
- **Grade 4 Science: Unit 1 – Life science: Habitats 301-2:** Relate habitat loss to the endangerment or extinction of plants and animals.

KEY TERMS

- **Organism:** an individual living thing.
- **Species:** a group of organisms that is unique or different from all other groups.
- **Ecosystem:** a community of organisms (living things) that interact with each other and depend on each other.
- **Taxonomic group:** a category of living things that are closely related and therefore share certain characteristics.

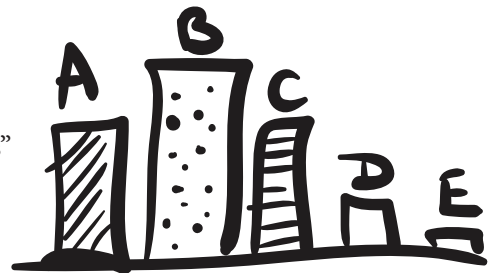


BACKGROUND INFORMATION

- Now that bioblitz observations in the schoolyard are complete, students will need to synthesize this information to get an idea of the “big picture” biodiversity in the schoolyard. This biodiversity can be represented in two ways: the number of individual organisms in the area, and the number of species in the area.
- An individual organism is just that – one thing. One student in a classroom, one dandelion on a lawn, one bird in the sky. Knowing how many individual organisms are in an area tells us how much life the area can support. Your schoolyard might be able to support five organisms, or 100, or 5000, or more!
- But it’s also important to know what *kind* of life your schoolyard can support. Different organisms rely on others to help them survive, and knowing which ones are living in your schoolyard can help you understand what organisms live there and why, and how those organisms interact with each other in the ecosystem.
- Scientists have developed rules to help them organize individual organisms into groups, based on their similarities and differences. These groups are called “taxonomic groups” (Domain, Kingdom, Phylum, Class, Order, Family, Genus, and Species). At each level of organization, the similarities and differences between organisms becomes more specific. A species is a group of organisms that is unique/different from all other groups.
- It is often difficult to identify different species from observations alone. Many scientists rely on DNA information to be able to separate groups of organisms at that level. Students certainly aren’t expected to be able to identify their observations to the species level, but encourage them throughout these activities to think carefully about the similarities and differences between organisms they found in the schoolyard.

INSTRUCTIONS**A) Total number of individual organisms in the schoolyard**

- 1 Divide students into groups. Let students work with the same group as they did during the bioblitz activity.
- 2 Have each group count the number of observations they made, and record this number as “total number of individuals” (e.g. 5 dandelions, 1 rose, 13 daisies = 19 flowers, not dandelions, roses, daisies = 3 flowers).
- 3 Draw axes for a graph on the board. The Y-axis is for the number of individual organisms observed in the school yard. The X-axis is for the taxonomic groups that students observed in the school yard.



- 4 Ask one student from each group to come to the board, write their taxonomic group name along the X-axis, and mark the number of individuals that they observed. Continue taking turns until all the groups are represented on the graph.
- 5 Have a quick discussion with the class about the graph – how many total individuals were observed? Add groups together – how many animals were observed? Plants?

B) Total number of species in the schoolyard

- 1 Students will repeat the activity, but with the number of species observed instead of the number of individuals.
- 2 Students may or may not have been able to identify species as they were making observations during the bioblitz. Ask students to take a quick inventory of their observations and mark which observations have and have not been identified. If you used *iNaturalist* during your bioblitz, most of this identification work has already been done for you!
 - You can decide what level of identification is appropriate for your class – is “butterfly” an acceptable identification, or would “monarch butterfly” be better?
- 3 Give students some time to identify any unidentified organisms, using online resources or field guides. Many of the organisms in the same taxonomic group will have similarities, so encourage students to think about how the organisms they found are different from each other. Challenge students to divide the organisms they found into categories, based on these differences. Students can focus on size, shape, and colour of the organisms, and maybe other identifying features such as number of limbs, antenna, visible patterns, etc. Some organisms will be easier to identify than others, so students who finish quickly can help other students with any challenging identifications.
 - **Note:** It’s okay if students aren’t able to specifically identify all the species they find! The main idea here is to get them to notice the similarities and differences between organisms. If students notice unique groups like “pink flowers with 4 petals” and “pink flowers with 5 petals”, these can count as “species”.
- 4 When students are finished identifying all their organisms, have each group count the number of individual species they found (e.g. 5 dandelions, 1 rose, 13 daisies = 3 species of flowers).
- 5 Repeat the graphing activity, with the Y-axis representing the number of species observed. You can do this as a separate graph or as a second set of data on the same graph.

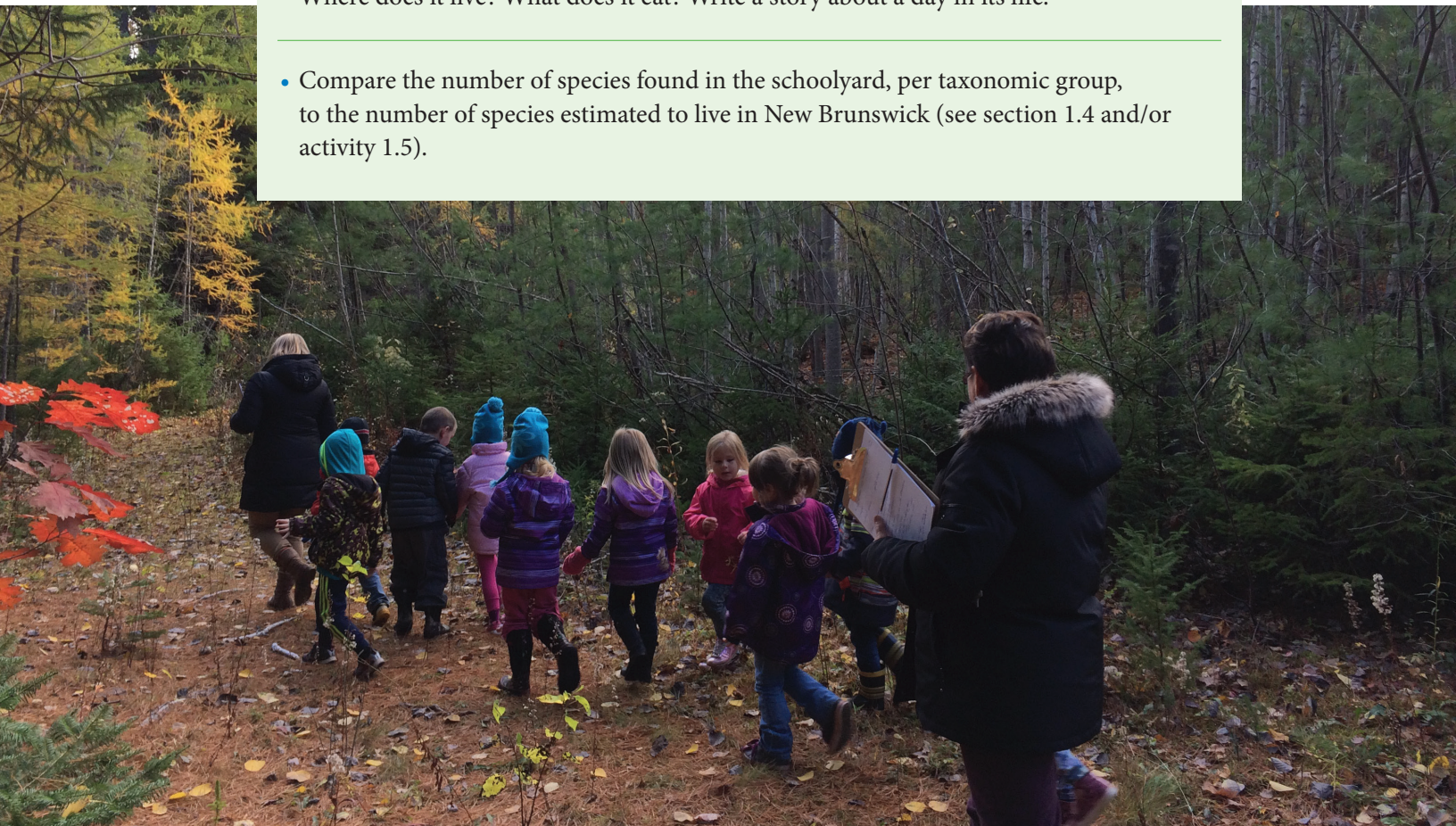


C) Discussion questions

- 1 How many different species were found?
- 2 Compare the number of species found for each taxonomic group to the number of individuals found in each taxonomic group.
- 3 Where in the schoolyard were the different species found? Why?
- 4 Do any species live closely together?
- 5 Do you think you missed anything when you were collecting your data in the schoolyard? Why?
- 6 What aspects of the bioblitz were easy? Challenging?
- 7 What do you think you would observe if you repeated this activity in a different season? At a different time of day?

Variations/Extensions

- Choose one of the organisms you found and research it more thoroughly. Where does it live? What does it eat? Write a story about a day in its life.
- Compare the number of species found in the schoolyard, per taxonomic group, to the number of species estimated to live in New Brunswick (see section 1.4 and/or activity 1.5).



APPENDIX Key Terms

Bioblitz – a fun activity that helps you find and understand the biodiversity near you by observing and recording all the living things you find in a specific area.

Biodiversity – the wide variety of life on earth and all the ways that different living things interact with each other.

Ecosystem – a community of organisms (living things) that interact with each other and depend on each other.

Habitat – where an animal or plant lives, including the food and shelter it needs to survive and the climate to which it is adapted.

Observation – data or information that you collect and record while observing something (using your senses to gather information).

Organism – an individual living thing.

Resources – an object or substance that a living thing needs to survive.

Species – a group of organisms that is unique or different from all other groups.

Taxonomic group – a category of living things that are closely related and therefore share certain characteristics.



We acknowledge the support of the Natural Sciences and Engineering Research Council of Canada (NSERC), which invests annually over \$1 billion in people, discovery and innovation.



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