Lessons in a Backpack

United Nations Educational, Scientific and Cultural Organization

LONG POINT BIOSPHERE REGION

The Monarch Butterfly

A Multi-Lesson Unit Plan on the Monarch Butterfly, Pollinators, and Milkweed

Description of Unit

Students will recognize that the Monarch butterfly is a significant species with a unique life history. Students will explore concepts including: butterfly life cycle, pollination, plant growth, and migration. They will recognize that people have complex relationships with Monarchs and the plants which sustain them. Students will discuss ways that humans interact with Monarchs, how human activities can threaten Monarch survival, and consider actions they can take to conserve pollinator species. Students will also explore many facets of plants including structure, function, and importance.

Connect with the Long Point Biosphere

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LONG POINT BIOSPHERE REGION

At a Glance

Grade Level: 1-3

This lesson is designed to for use with Grades 1-3 over the course of several weeks. Activities can also be used independently. Activities are designed to meet Ontario science curriculum standards for the grades indicated, however some teachers may wish to adjust activities slightly for a different grade.

Learning Environment:
Indoor classroom
Outdoor garden or green space

Prep Time:
See each Lesson for specifics

Length of Unit:
Approximately 1 -2 months

Length of Lesson:
See each Lesson for specifics

Key Vocabulary: Monarch, Chrysalis, Metamorphosis, Milkweed, Glider, Roots, Photosynthesis, Flower, Stamen, Pistil, Leaf, Seed, Stem

Staffing: 1 educator

Materials:
See each grade level's cover page and each lesson for specifics

Groupings: Whole class, small groups

Teaching/Learning Strategies:
Discussion
Observing and recording
Kinesthetic games
Reading & Writing
Video exploration

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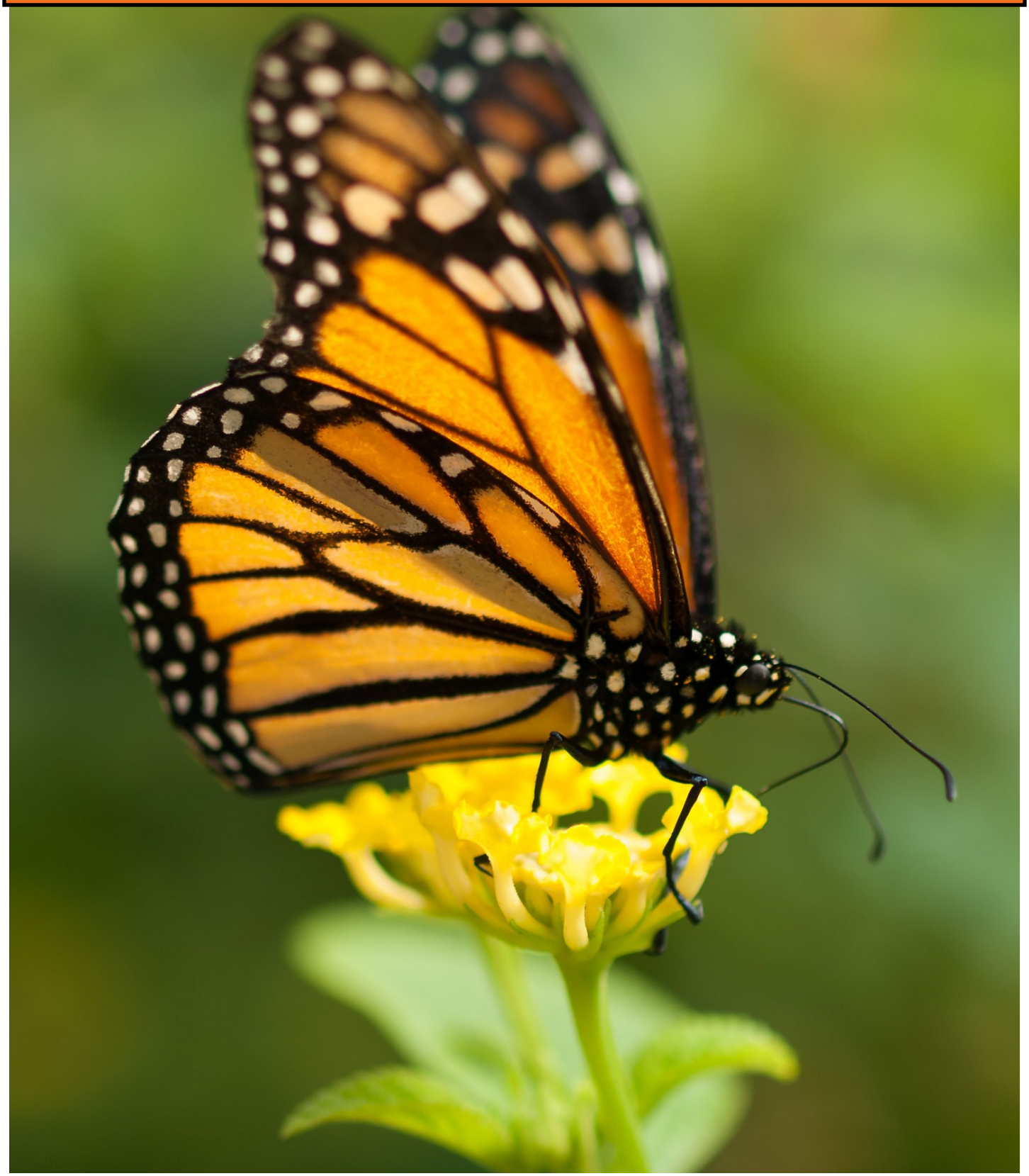
Grade One



Unit Outline

Time	Lesson	Location	Materials
1 hour	An Introduction to Monarch Butterflies	Indoor and Outdoor	Know - What to know - Learned (KWL) Chart, markers, YouTube
2x 1 hour lessons	A Monarch's Life Cycle	Indoor	*The Life Cycle of a Butterfly* by Bobbie Kalman, life cycle poem, copies of the life cycle cut-out squares, construction paper, glue, scissors, crayons, YouTube
1 hour	Monarch's Basic Needs	Indoor	Chalkboard or whiteboard, *Monarch Butterfly* by Gail Gibbons, paper, coloured pencils
1-2 hours over multiple days	Insects in Winter	Indoor and Outdoor	*Bugs and Bugsicles: Insects in the Winter* by Amy S. Hansen, 1 cup sugar, warm water, cup, ice cube tray, winter landscape image, insect images
45 minute periods over several days	Observing Monarch Butterflies	Outdoor (best in spring)	Journals, thermometer, magnifying glasses, Golden Guide to Insects

Curriculum Expectations

UNDERSTANDING LIFE SYSTEMS NEEDS AND CHARACTERISTICS OF LIVING THINGS

1.1 Identify personal action that they themselves can take to help maintain a healthy environment for living things, including humans

2.2 Investigate and compare the basic needs of humans and other living things, including the need for air, water, food, warmth, and space, using a variety of methods and resources

2.3 Investigate and compare the physical characteristics of a variety of plants and animals, including humans

3.1 Identify environment as the area in which something or someone exists or lives

3.2 Identify the physical characteristics of a variety of plants and animals

UNDERSTANDING EARTH AND SPACE SYSTEMS DAILY AND SEASONAL CHANGES

1.2 Assess ways in which daily and seasonal changes have an impact on society and the environment

ORAL COMMUNICATION

1.1 Identify purposes for listening in a few different situations, formal and informal

1.2 Demonstrate an understanding of appropriate listening behaviour by using active listening strategies in a few different situations

1.3 Identify a few listening comprehension strategies and use them before, during, and after listening in order to understand and clarify the meaning of oral texts, initially with support and direction

1.6 Extend understanding of oral texts by connecting the ideas in them to their own knowledge and experience; to other familiar texts, including print and visual texts; and to the world around them

MEASUREMENT

- Estimate, measure, and describe the passage of time, through investigation using nonstandard units
- Read demonstration digital and analogue clocks, and use them to identify benchmark times and to tell and write time to the hour and half-hour in everyday settings
- Relate temperature to experiences of the seasons

Lesson 1: An Introduction to Monarch Butterflies

This activity gives students a chance to brainstorm what they already know and what they want to know about Monarch butterflies to help launch a study rooted in observation. This activity is best done in March or April to start the spring/summer unit on Monarchs.

Time Needed: 30 minutes indoors, 30 minutes outdoor school yard walk

Materials: KWL chart, markers, YouTube access, Milkweed identification (at bottom of page)

Use a Know – Want to Know – Learned (KWL) chart, to begin the study of Monarch butterflies. Ask students what they already know about Monarch butterflies and record their ideas under the KNOW section of the chart. Review the statements listed on the KWL chart.

KNOW	WANT TO KNOW	LEARNED
Monarchs have black and orange wings.	How do the caterpillars move?	
We don't see Monarchs in the winter.	What do Monarchs like to eat?	
Monarchs like flowers.	Can you touch Monarchs?	

Next ask students what they want to know about Monarchs and record their ideas as questions under the WANT TO KNOW section of the chart. Tell students that questions often begin with "Question Starter" words that help us recognize a question is being asked. Brainstorm or share examples of these words, then challenge students to make up questions about Monarch butterflies. Questions should begin with a Question Starter word.

Question Starter Words

Is…?	Who…?	When…?	Can…?
If…?	What…?	How…?	Should…?
Do…?	Where…?	Did…?	Would…?
May…?	Why…?	Does…?	Could…?

If students struggle to develop their own questions, encourage them to imagine what they might ask a Monarch butterfly if they could. Have them think about the things a butterfly must do or see in a day, and come up with a question based on these activities. Once the list of questions is sufficient in length, discuss how, as a class, you will get the answers to these questions. Inform the class that you will be visiting Monarchs at the school in the place they are most likely to be found. Where is this place? The gardens!

Tell students that the last part of the chart is for what we LEARNED, which will be completed once our study is complete.

Watch the video *Kids News Break - Monarch Butterflies* (3 min) as a further introduction to Monarchs. www.youtube.com/watch?v=WAHpP6Vgmik&t=83s

Lead the class on a walk through the school yard and discuss the video and questions outdoors. Look for milkweed plants in areas they might grow and look at the plant closely with students. Milkweed will be present in many of the activities students complete.

Milkweed Identification (https://www.naturewatch.ca/milkweedwatch/identifying-milkweed/)

Lesson 2: A Monarch's Life Cycle

The butterfly life cycle, with its dramatic transformation, is a classic illustration of the concept of life cycles. In this activity students will make a model that illustrates the life cycle of a butterfly.

Time Needed: Two 1 hour lessons

Materials: *The Life Cycle of a Butterfly* by Bobbie Kalman, life cycle poem, copies of the Life Cycle cut-out squares, construction paper, glue, scissors, crayons, YouTube

Day One:

Introduce the class to the life cycle of a Monarch butterfly by reading *The Life Cycle of a Butterfly* by Bobbie Kalman. Review the new words:

Chrysalis - a hard shell created by a butterfly caterpillar in which a transformation takes place.

Metamorphosis - a process some animals (usually insects) go through to become adults. It is a series of physical changes.

As a class, repeat the following poem several times. Encourage students to remember it over time.

On a milkweed plant, an egg starts it all.
From this egg, a caterpillar will crawl.
This caterpillar eats milkweed leaves all day.
It will grow and grow, and soon will say,
"I'm ready for my butterfly time."
It will make a chrysalis that will shine.
What happens inside is a mystery to us.
A butterfly is born from that chrysalis!
The butterfly goes to find flowers for food.
It will soon lay an egg on a milkweed near you!

As you read it again, ask students to act out each line as it is read. Think about the body parts of the Monarch at each stage. Encourage students to move as a Monarch might in each life cycle stage.

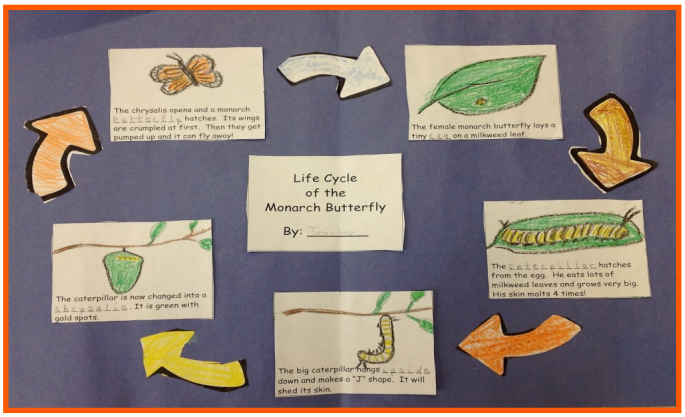
Discuss:
How does this compare to other types of animals?
How is this different from people and our pets?
How is this different or the same as other animals like birds, reptiles, and fish?

Day Two:

Discuss what was learned about the Monarch's lifecycle the previous day. Have any of the questions on the KWL chart been answered?

Hand out the Life Cycle cut-outs. Have students fill in the spaces on each square using the words at the bottom of the page. Once all the words have been used, students can draw pictures in each square of what is described.

When all pictures are finished, each square can be cut out and placed on construction paper in order of the lifecycle. Be sure to check students' work before they glue the squares to the paper. Arrows can be cut out or drawn on.



Bonus! Show a time-lapse video. It takes a Monarch roughly 10 minutes to build the chrysalis, 10 days are spent inside the chrysalis, and 10 minutes to emerge. *Monarch Butterfly Metamorphosis* (3 min): www.youtube.com/watch?v=ocWgSgMGxOc

Encourage students to explain how the caterpillar and chrysalis changed. What might happen inside the chrysalis?

Life Cycle
Monarch Butterfly

By: _____

The female Monarch butterfly lays a tiny _ _ _ on a milkweed leaf.

The chrysalis opens and a Monarch _ _ _ _ _ _ _ _ _ _ hatches. Its wings are crumpled at first. Then they get pumped up and it can fly away!

The _ _ _ _ _ _ _ _ _ _ _ _ hatches from the egg. They eat a lot of milkweed leaves and grow very big. Their skin molts 4 times!

The caterpillar is now changed into a _ _ _ _ _ _ _ _ _ _ . It is green with gold spots.

The big caterpillar hangs _ _ _ _ _ _ _ down and makes a "J" shape. It will shed its skin.

WORD BANK:

chrysalis upside butterfly caterpillar egg

Lesson 3: Monarch's Basic Needs

In this activity students will review what basic needs are for all living things. Then through a video and walk outdoors, students will think about what the basic needs of a Monarch butterfly are.

Time Needed: Introduction 15 - 20 minutes, Monarch activities 30 - 40 minutes

Materials: Chalkboard or whiteboard, *The Monarch Butterfly* by Gail Gibbons, paper, coloured pencils

If your class has not reviewed plants and animals' basic needs, begin by asking questions such as:

- What do you need to survive?
- What do plants and animals need to live?
- How are all living things alike?
- How are living things different?

Guide your class in generating a list of basic needs by asking them if they have pets. Ask the class what a pet cat needs to live and stay healthy? How about a hamster?

- What factors do you think about when taking care of pets?
- Can all pets live in a small tank? Why not?
- Would these animals survive outside in summer and in winter?

Tell students that in a healthy environment, an animal or plant will find everything it needs to survive. There are five basic needs - food, water, air, shelter (from predators and/or the elements), and space to live. See if students can identify them by providing clues (take a deep breath, talk about breakfast, point out the weather).

Ask the class to describe the school garden. How is it different than their home? What is it like in the gardens? What kind of animals live there? Do the needs of animals in the garden differ from pets? Do they differ from the needs of humans?

To learn more about Monarchs, what they do, and what they may need, read *The Monarch Butterfly* by Gail Gibbons. Discuss the following questions:

- What do we know that butterflies need?
- What are the non-living needs of the Monarch? (ex. water, sunlight)
- Can a Monarch's needs be meet anywhere?
- What would happen to the Monarch if there were no more milkweed plants?

As a class, walk to the school garden or nearby green space. Observe different plants, animals, and objects. Review each by asking: "How may this help a Monarch or another animal meet its needs?"

While outdoors, look at milkweed emphasizing that this plant is a very important basic need, it cannot be swapped out for any other plant! Gradually encourage students to think about a Monarch's basic needs in more detail. Examples may be: Monarchs also need milkweed to make a chrysalis on; Monarchs sometimes need shelter from wind but they also need winds to help travel.

Back indoors, task students to draw a picture of a Monarch butterfly in nature surrounded by plants, animals or other things that help it to meet its basic needs.

Lesson 4: Insects in Winter

In these activities students will compare winter survival strategies for several types of insects. They explore local habitat to find insects in their winter stages.

Time Needed: 1-2 hours or can be spread over multiple days

Materials: *Bugs and Bugsicles: Insects in the Winter* by Amy S. Hansen, 1 cup sugar, warm water, cup, ice cube tray, winter landscape image, insect images

Like reptiles, insects are cold blooded and must use strategies to deal with cold weather. In Canada, insects can spend most of their lives overwintering! As a class, brainstorm what an insect might do when the temperature drops. With prompting, students may identify the major strategies: 1. Enter a dormant stage (*diapauses*) similar to hibernation (this can happen at any stage); 2. Migrate to a warmer area, like the Monarch; or 3. stay active in a sheltered location.

Read the book *Bugs and Bugsicles: Insects in the Winter* by Amy S. Hansen and/or watch Where do insects go during the winter? (2 min) www.youtube.com/watch?v=SXoJ2pRtolg

Discuss the reference in the video to a chemical called glycerol. Many insects use this to prevent their bodies from freezing. Students can think of this chemical as “sugar water”. The sugar needs colder temperatures than water to freeze, so when an insect eats sugary substances or releases water from its body, their cells become “syrupy” and don’t freeze. Explain to students they’ll see how this works with an experiment.

Mix 1/2 cup of sugar and four cups of warm water and stir to dissolve the sugar. Fill one ice cube tray with plain water. Fill the second tray with the sugar and water mixture. Put both ice cube trays into the freezer or outside if cold enough.

Meanwhile, project on the board the winter landscape image and read the rhymes associated with each insect. Based on the rhymes, discuss where a good overwintering spot might be and ask students to place the insect picture in a good spot one at a time.

Students might not understand that underground can actually be warm in the winter. Explain that snow, although cold, is warmer than the air above and acts like a blanket for everything underneath. This is one of the reasons why winter’s without much snow can actually not be helpful for wildlife.

Check the trays after one hour. Are either of the trays frozen? Continue checking the trays to see which tray’s water has frozen first. What would happen if you mixed more sugar with water?

Keep in mind the rhymes of where certain insects spend winter, go outside to explore for signs of insects. Some will have made their own shelter while others retreat into cavities, under bark, fallen leaves, or into the ground. Can you find galls, cocoons, snow fleas, or other signs?

EXTENSION Integrate Music and Movement

Play ‘Musical Insects’. Chairs are labeled with lift-up flaps showing different shelters, most are helpful (logs, bark, streams) but 2-3 can be parking lots or woodpeckers. Students are insects and when the music stops, they must find a shelter. Once seated in a chair, they lift up the label to make sure it is a safe habitat. Any insect that has no chair or finds the woodpecker is eliminated. Remove two chairs, change some labels to other chairs and repeat.

INSECT	OVER WINTER STAGE	PREP/ ACTIVITY LEVEL	OVER WINTER SPOT	POEM
Ants, Carpenter	Adult	Anti-freeze; Inactive	In trees or logs	Carpenter ants, the wood of trees explains your name. It is where you winter too, one and the same.
Bumblebees	Queen	Re-fertilized eggs inside queen; inactive	Underground, under leaves or logs	Bumblebee queen, you waved goodbye to other bees. Now under logs where no one sees.
Crickets (Most)	Egg	Inactive	In the ground	Crickets, once so loud at night. Now under the earth out of earshot and out of sight.
Dragonflies	Egg, Nymph, or Adult	Egg: inactive; Nymph: Semi-active; Adult: migrate/ active	Egg and Nymph: Bottom of a pond; Adult: may migrate	Dragonfly nymph you're staying under the water. You might be there for years, even when the weather gets hotter.
Fireflies (Most)	Larva	Inactive	Underground	Fireflies you lay as "worms" underground. We'll need spring to come for you to crawl around.
Goldenrod Gall Fly	Larva	Anti-freeze; inactive	Goldenrod stems	Goldenrod Gall Fly, the home you've made stands out to all. So big compared to the egg so small.
Grasshopper	Egg	Inactive	In the ground	Grasshopper eggs, you were tucked safe under grass. To be hidden under snow until winter is past.
Honeybees	Adult	Store food; semi-active	In tree or box	Honeybees are on a break from busily making honey. You'll stay in the warm hive but pop out if it's sunny.
House Fly	Adult	Inactive except when warm	In building or hollow trees	Houseflies, I know you're in my home out of sight. On a warm sunny day, you crawl out into the light.
Ladybugs	Adult	Cluster together; inactive	Under leaves/ grasses or in buildings	Ladybugs, where did you go? To hide under the leaves with insect friends and foe.
Monarch	Adult	Migrate; semi active	Mexico or California	Monarch butterfly, I know where you go! You fly thousands of miles south to Mexico.
Mosquitoes	Adult Females	inactive	Sheltered place	Adult females you've found a small hole to pass the time. In the spring, I know how you like to dine!
Paper Wasps	Queen	Fertilized eggs; inactive	In the ground	Wasp queen, you waved goodbye to your kind. Now under-ground you'll stay, away from sunshine.
Woolly Bear	Larva	inactive	Under leaves/ grasses	Woolly Bears, under leaves and snow you are fast asleep. But I've seen you on snow, how slowly you creep.

Lesson 4: Insect Images


Carpenter ants


Bumblebee


Dragonfly Nymph


Firefly larvae


House Fly

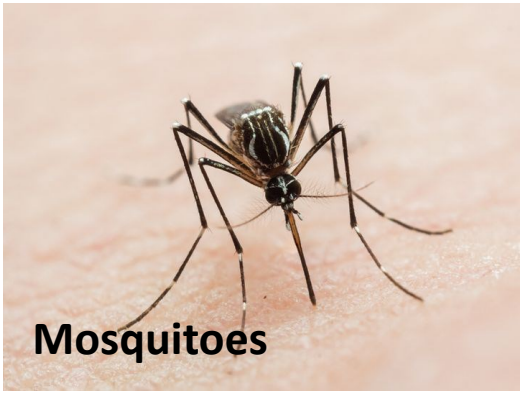

Grasshopper eggs


Honeybee


Cricket eggs


Goldenrod Gall Fly larvae

Lesson 4: Insect Images



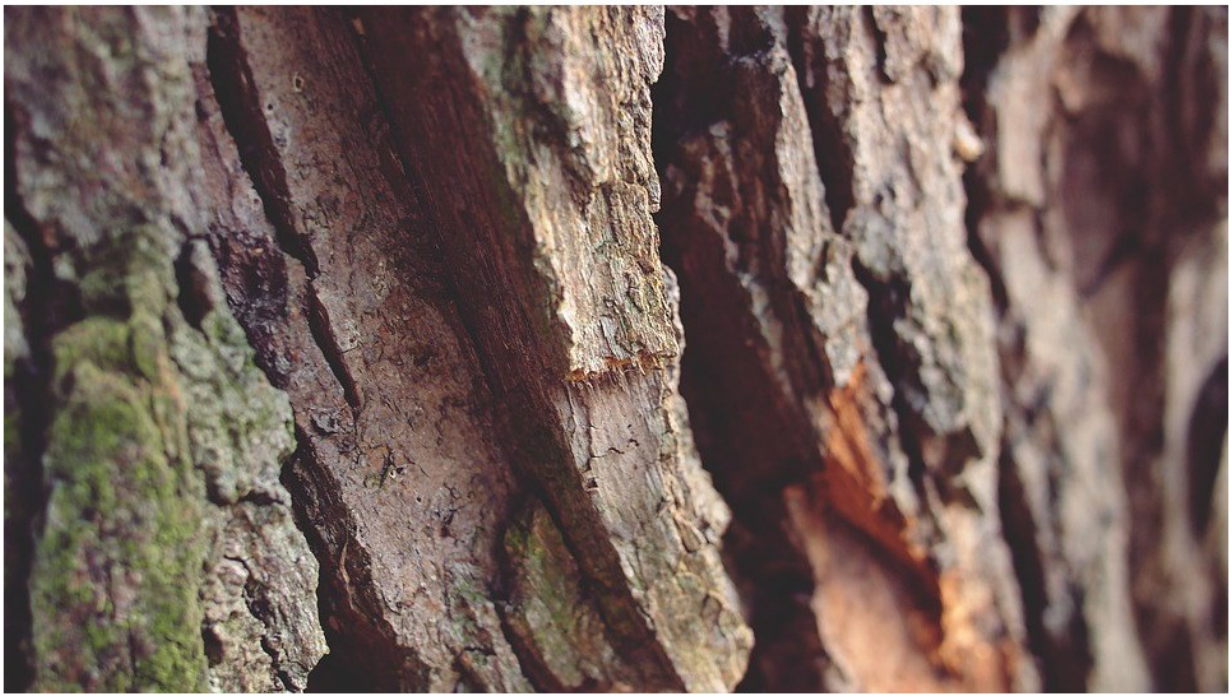
Lesson 4: Winter Landscape Image

In a stream or river

Safe

Under bark

Safe



Underground

Safe

Rotting log

Safe

Parking lot

Not safe!

Woodpecker

Not safe!

Lesson 5: Observing Monarch Butterflies

This activity combines key components of the unit into regular visits to a garden or green space for observation and measurement. It is best started in spring when the school garden or nearby green spaces are beginning to grow and the first Monarchs are returning to Ontario. Students will practice observation by looking at Monarch butterflies and other insects, as well as plants in the garden.

Time Needed: 45 minute periods over several days

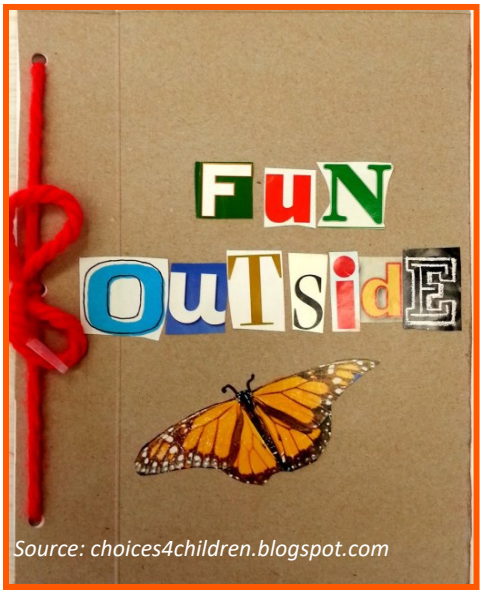
Materials: Journals, thermometer, magnifying glasses, Golden Guide to Insects

Review the time of year with students (spring). Inform students that adult Monarch butterflies fly to Mexico during Ontario's winter and will be returning in the upcoming weeks.

Tell students that it's time to learn more about Monarchs by looking for these animals! Inform the class that over the next few weeks, they will be visiting Monarch gardens often to watch changes over time and journaling what they see.

It is important that students record the same information each time the class goes outside. Brainstorm a list of things for everyone to observe and record. These might include:

- Weather (clouds, sun, rain, wind)
- Temperature
- Time and date
- Number of insects and Monarchs
- Type of insects
- Life cycle stage
- Other wildlife
- Height of plants
- Number of flowers
- Colour of flowers
- Other features (shape)



Source: choices4children.blogspot.com

Students can work in pairs or individually. They will need to write or draw observations. You may wish to create a worksheet listing the things to record for each visit, or a journal could be built as an art project using recycled materials (scrap paper, cereal boxes, yarn).

Going Outside – Daily Plan

Instruct students on proper behaviour around insects and plants: respect the animals, don't pick plants and don't scare the insects if they fly close to you.

Visit the school garden or green space. Start by recording common measurements together, such as start time, date, temperature, and weather.

Individually or in pairs, instruct students to select one site in which to sit and observe. You can call this their 'sit spot'. This is where they will return each time they visit the garden, and the surrounding plants will be the ones used for recording.

Allow 30 minutes for students to record and draw the surroundings.

Use the Golden Guide to Insects to identify any animals you see.

Discuss results with class. What type of animals did you see? What flowers were visited the most by pollinators? What colours were the flowers? Remind class that many native species of bees, flies, and butterflies help pollinate flowers in Canada.

This is a _____.

Draw what you saw here.

Description of what I saw:

_____

Size of what I saw:

_____

Weather today:

_____

Temperature today:

_____

This is a _____.

Draw what you saw here.

Description of what I saw:

_____

Size of what I saw:

_____

Weather today:

_____

Temperature today:

_____

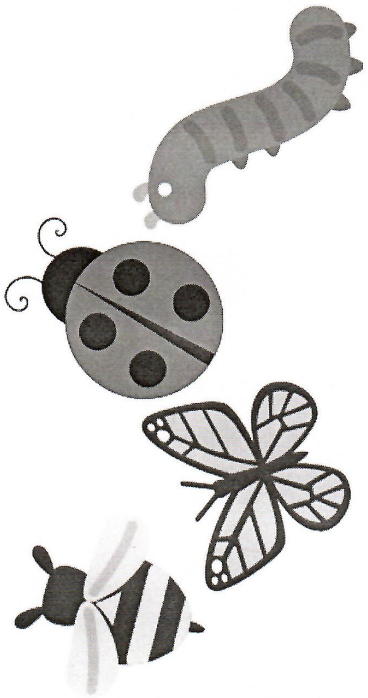
Lessons in a Backpack

_____'s

Sit and Spot

Garden

Observations



Extension Activities

This activity lends itself to many other curriculum connections. Consider incorporating the following into your routine garden visits:

Activity 1: PLANTS

Many of the activities listed in this guide under the Grade 3 section can be adapted for use with a Grade 1 class. Flip to the Grade 3 Subcategory in this booklet.

Activity 2: MATH

Practice numeration and measurement with students. Students can reflect back to previous garden visits to observe how different the temperature and weather was and compare it to how many Monarchs and other insects they see. Students can also measure the height of plants each time the garden is observed, using their finger, pencil, or similar object as the unit of measurement.

Activity 3: CITIZEN SCIENCE

Register your class for Monarch Watch and report your sightings from each garden visit to an international database! Monarch Watch provides extensive resources for students about Monarch butterflies. You can register your school garden as a Monarch waystation and order tags for your butterflies so they can be tracked by other participating schools. This is a great opportunity for students to learn about the problems Monarchs face and identify their role in conservation. www.monarchwatch.org

Activity 4: ART

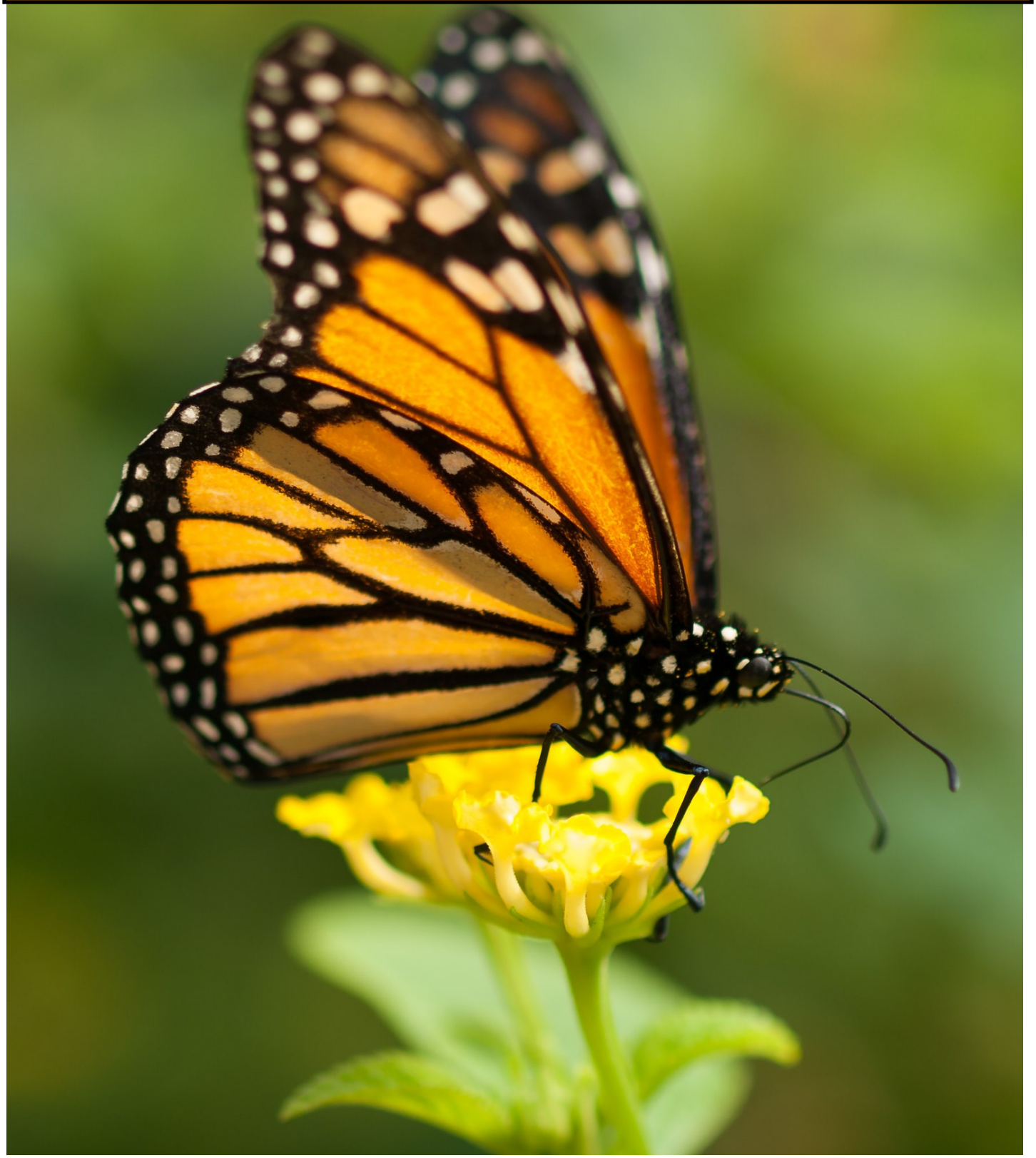
Numerous art projects can be created with the gardens as the subject, inspiration, or even medium (e.g. using leaves as “nature paint brushes”). To explore colours, provide students with a selection of green, brown, and floral coloured paint chips and see if they can find something that matches each in the garden or outdoor space.

Activity 5: CULTURE

Read the story of *Nanabosho and the Butterflies* by Joe and Matrine McLean. Discuss what the importance of plants and animals in this book are. What do students think the meaning of the story is? What does the story teach us?

A butterfly garden. Source: flickr.com

Grade Two



Unit Outline

Time	Lesson	Location	Materials
25-30 minutes	The Truth about Monarchs	Indoor	*A Monarch Butterfly Story* by Melissa Kim
1 hour over 2 days	Create a Garden Insect Wall	Indoor and Outdoor	Parts of an Insect worksheet, Insect Close up Worksheet, Insect Golden Guide, camera (optional), journals, pencils
1-2 hours	Monarch Migration	Indoor	Placemat or other mats, rope to mark boundaries
30 minutes	Warning! I'm Brightly Coloured	Indoor and Outdoor	Slide show, butterfly cutouts for Lesson 5
1.5-2 hours	Exploring Monarch Flight	Indoor and Outdoor	Glider pattern, stiff paper, tape measure, Butterfly Glider Worksheet, scissors, glue, tape, graph paper, ruler, 2 pennies per glider. For student-designed gliders: additional paper of varying weight and stiffness, paperclips, play dough for weight.

Curriculum Expectations

UNDERSTANDING LIFE SYSTEMS GROWTH AND CHANGES IN ANIMALS

1.1 Identify positive and negative impacts that animals have on humans and the environment, form an opinion about one of them, and suggest ways in which the impact can be minimized or enhanced
1.2 Identify positive and negative impacts that different kinds of human activity have on animals and where they live, form an opinion about one of them, and suggest ways in which the impact can be minimized or enhanced
2.3 Investigate the life cycle of a variety of animals, using a variety of methods and resources
2.4 Observe and compare changes in the appearance and activity of animals as they go through a complete life cycle
3.1 Identify and describe major physical characteristics of different types of animals
3.2 Describe an adaptation as a characteristic body part, shape, or behaviour that helps a plant survive in its environment
3.3 Identify ways in which animals are helpful to, and ways in which they meet the needs of, living things, including humans, to explain why humans should protect animals and the places where they live
3.3 Describe ways in which living things, including humans, depend on air and water

DATA MANAGEMENT AND PROBABILITY

- Demonstrate an ability to organize objects into categories, by sorting and classifying objects using two attributes simultaneously
- Collect and organize primary data that is categorical or discrete, and display the data using one-to-one correspondence in concrete graphs, pictographs, line plots, simple bar graphs, and other graphic organizers, with appropriate titles and labels and with labels ordered appropriately along horizontal axes, as needed

DATA RELATIONSHIPS

- Read primary data presented in concrete graphs, pictographs, line plots, simple bar graphs, and other graphic organizers, and describe the data using mathematical language
- Pose and answer questions about class generated data in concrete graphs, pictographs, line plots, simple bar graphs, and tally charts
- Demonstrate an understanding of data displayed in a graph, by comparing different parts of the data and by making statements about the data as a whole

ATTRIBUTES, UNITS, AND MEASUREMENT SENSE

- Estimate and measure length, height, and distance, using standard units and non-standard units
- Record and represent measurements of length, height, and distance in a variety of ways

Lesson 1: The Truth about Monarch Butterflies

This simple activity gives students a chance to remember or hear of information related to the Monarch butterfly's lifecycle and characteristics.

Time Needed: 25-30 minutes

Materials: *A Monarch Butterfly Story* by Melissa Kim

Introduce students to the Monarch butterfly unit by examining what they already know and remember about Monarch Butterflies.

Ask students to demonstrate with a show of hands:

- Who has seen a Monarch butterfly before?
- Who remembers the stages in a Monarch butterfly's life cycle?
- Who remembers where monarch's go to winter?

Identify one side of the classroom or outdoor space as 'True', the opposite side as 'False' and the middle ground as 'Not Sure'. Read the True False Statements out loud and have students move from side to side with their answers. Review the answer after each question.

Have students return to their seats or sit in a circle outside. Discuss what stood out most to students. Use a map or globe to demonstrate where we are and where Mexico is in the world. Has anyone ever been to Mexico? How would we get there if we wanted to? Could anyone find there way there without an airplane?

Read the book *A Monarch Butterfly Story* by Melissa Kim. Have students reflect on what they have learned so far by writing several sentences (or drawing a picture) of a memorable interaction they had with a Monarch butterfly. Encourage students to express how the Monarch made them feel and see if they can remember other information like what time of year it was.

TRUE FALSE STATEMENTS

1) There are four stages of metamorphosis of the Monarch: egg, caterpillar, chrysalis, and adult. **T**

2) The Monarch is not a highly-evolved insect. **F**

3) Monarchs are found in Ontario year round. **F**

4) One individual Monarch Butterfly cannot navigate thousands of miles to a place it has never been. **F**

5) Monarchs have migrated annually for thousands of years. **T**

6) Adult Monarchs weigh as much as a car key. **F** (they weigh as little as a paper clip).

7) Monarchs can fly up to a mile high in the sky. **T**

8) Monarchs sense and avoid features such as large bodies of water and mountains. **T**

9) Monarchs depend on one type of plant to lay their eggs on. **T** Milkweed

10) Milkweed is poisonous to most animals, therefore Monarchs are poisonous to many animals. **T**

11) To conserve energy, Monarchs catch rides on winds or airwaves. **T**

12) Natural predators eat up to 90% of eggs/ caterpillars before they form the chrysalis. **T**

13) The Monarch does not face any human threats to their populations. **F**

14) Climate change may already be having a major impact on the butterflies. **T**

Lesson 2: Create a Garden Insect Wall

Students will observe and compare insects in the school garden or green space. Students will describe the physical characteristics of the creatures and research them to identify what species they could be. This activity is meant to dispel fears that insects are scary or that all insects bite.

Time Needed: 1 hour over 2 days

Materials: Parts of an Insect worksheet, Insect Close up Worksheet, Insect Golden Guide, camera (optional), journals, pencils

Day One

Tell students that they will be looking at more insect species in addition to the Monarch butterfly.

Ask students to brainstorm a list of insects they have seen around their homes and the school. Encourage them to remember details: were there many insects or only one? What time of year was it? What was this insect doing?

Ask students to compare their list with the child next to them for 5 minutes. Then compare in small groups. Each group can share 2-3 of the most interesting or significant insect encounters with the class. You might point out that while most insects are harmless and in some cases helpful to people, the stories that are told are usually of large insects or ones that are "scary". Insects get a bad reputation.

What makes an insect an insect? Hand out the Insect Worksheet to students and ID the parts of an insect.

Day Two:

Visit the school garden or a nearby green space. Review proper outdoor behavior and how to show respect for plants and animals. You may also wish to point out that students should observe wasps only from a distance, or not at all. Students should work in pairs to locate one type of insect or bug in the school yard or garden. They can observe it for at least 10 minutes to ensure they see its characteristics and behaviour.

In a science notebook or on regular paper, have students list some words to describe it. Then photograph or sketch it. Using the Insects Golden Guide, try to identify what the insect is. Once back in the classroom, hand out the Insect Close Up worksheet and continue to use the Insects Golden Guide or look online to find out more about this type of insect:

a) Name and Kind of Insect with Photo
b) What does it look like?
c) Where does it live?
d) What does it eat?
e) Life Cycle
f) Fun Facts

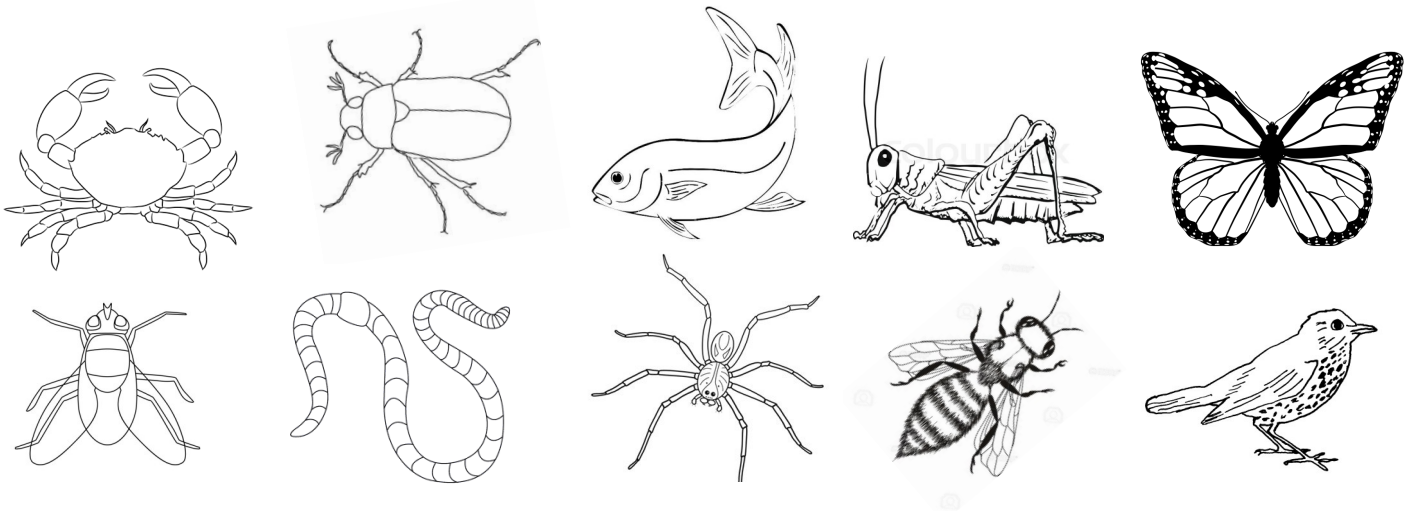
If you can't ID an insect your class found, email the Long Point Biosphere at education@longpointbiosphere.ca Display all the Close Up worksheets on the wall. As a class, look for connections among the insects - does one insect eat another? Are two similar looking? Make the connections stand out by using yarn to illustrate links.

EXTENSION Conduct an Insect Bioblitz!
Enter all the types of insects found into a table, add an unknown option, and provide a copy to each student pair. Allow 30 - 60 minutes outside for the class to slowly make their way across the school yard or garden. Students should look for all insects as they walk and tally what they find on the list. Which insect is found most? This activity can be adapted so students search different areas and compare their results.

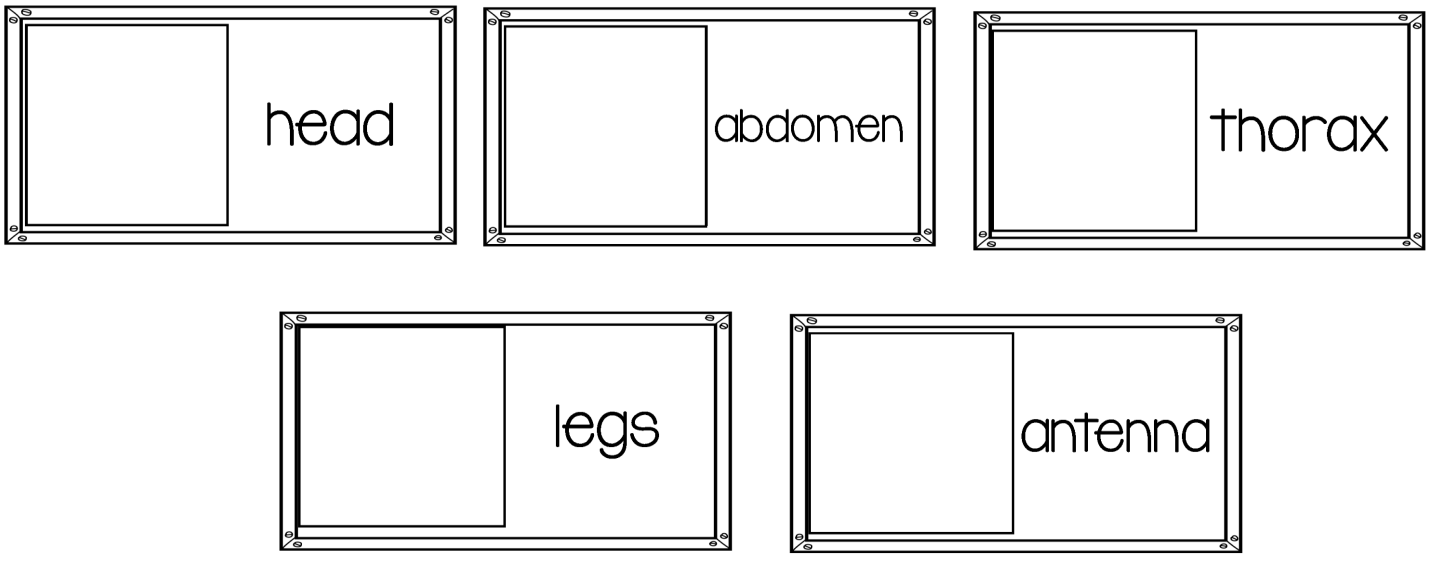
Parts of an Insect

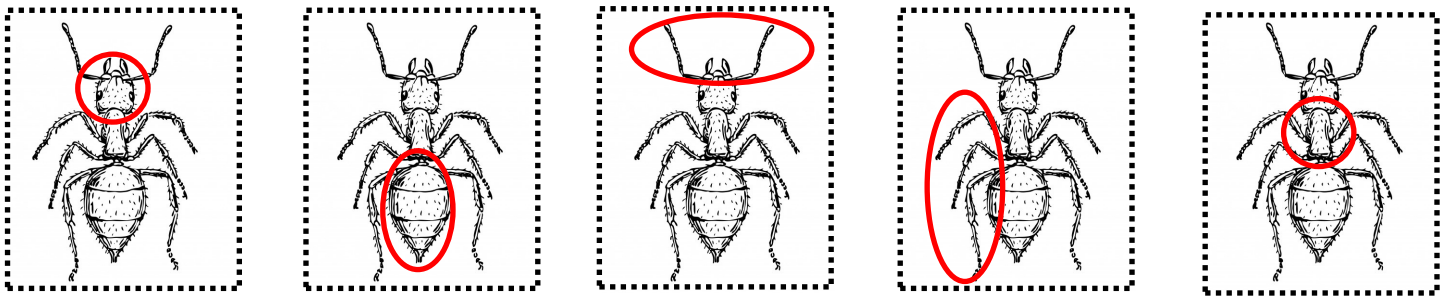
Name _____

Directions: Circle each animal that is an insect. **Hint:** Does it have all the parts listed below?



Directions: Each picture below has a different body part circled. Cut out the pictures and glue them into the box to match the body part word with the circle.





Insects and Bugs Close Up

Name _____

Draw the insect or bug here, or paste a picture of it:

a) Insect's Name:

b) It looks like:

c) It lives:

d) It eats:

e) Its lifecycle:

f) Fun Facts:

INSECT BIOBLITZ

Keep a tally of what you observe in the garden! Name:_____

Bio group	Tally	Number Observed
Caterpillars		
Wasps & Bees		
Butterflies		
Spiders		
Mosquitoes		
Lady Bugs		
Unknown		

Graph what you have observed in the garden! Create a scale that is appropriate for the amount of data that you have collected.

Caterpillars Wasps/Bees Butterflies Spiders Mosquitoes Lady Bugs Unknown

Lesson 3: Exploring Monarch Migration

Students will make paper butterflies using a template and then modify this template to make the most efficient glider.

Time Needed: 1-2 hours

Materials: Placemats/other mats, rope to mark boundaries

Reintroduce students to Monarch migration by watching one of these videos:

- *Monarch Migration - HD Documentary* (48 min) www.youtube.com/watch?v=RPQimPt2HYc
- *Monarch Butterflies: Great Migration* (5 min) www.youtube.com/watch?v=QpffQtKN-gk

Tell students they will experience this migration - not a field trip to Mexico - but an outdoor game.

Outside or in the gym, set up the playing field. Have "Mexico" at one end and "Ontario" about 15 meters away. Draw sidelines in the ground between the site or use rope to mark boundaries. Lay placemats at each site and scattered between the two sites, these represent Milkweed gardens, Mexican forests, and other nectaring sites.

Explain that students are Monarchs in their summer habitat (Ontario). They spend their summer nectaring on flowers and laying eggs on milkweed plants. Students need to be touching placemats at all times. Up to three students can have their foot on one placemat at a time.

To migrate successfully each student needs to flutter their wings and make 5 stops on the way to different placemats. If at any time a student cannot put a foot on a placemat, that means they cannot find what they need to live. They will "die" and move to the sidelines temporarily.

Fall has come to Ontario. The days are shorter, flowers are fading and it is cooler out. The student Monarchs know it is time to migrate south. Have one practice round before starting the migrations.

FIRST MIGRATION Year 1700. Your ancestors have migrated for thousands of years. Its your turn to migrate slowly between summer and winter sites, there is more than enough for all the Monarchs.

SECOND MIGRATION Year 1950. There has been an agriculture boom in the US for years. Natural prairies and fields were converted to corn fields and farmers spray pesticides to kill wildflowers and other plants that complete with their crops. (*Remove placemats*).

THIRD MIGRATION Year 2000. Loggers have removed many trees from the Mexican forests. This is a huge loss of habitat. (*Remove placemats*). Some students will be standing along the sidelines after this migration. Assure them they may be able to re-enter the game.

FOURTH MIGRATION Year 2002. People in Canada and US are learning about the problems Monarchs face and are helping by planting milkweed. Add placemats to the migration route and to Ontario. The Monarch population has increased! (*Students from sidelines can re-join*).

FIFTH MIGRATION Year 2005. What a great year! The Mexican government put in new logging regulations and the weather is perfect for migrating. The Monarch population has increased! (*Students from sidelines can re-join*).

SIXTH MIGRATION Year 2008. This is the hottest year in recorded history. The climate is changing, there is drought across the migration route and winds have changed direction. This affects your flight and the cycle of milkweed. (*Remove placemats in Ontario and on route*).

SEVENTH MIGRATION Year 2030. Students get to decide. What will happen next for the Monarch butterflies?

	Negative Factors	Positive Factors
Winter Habitat	• Illegal logging in Mexico's forests • Snowstorms • Disease outbreak • Pesticide use in agriculture and along roadways • Unseasonal temperatures	• Moderate temperatures • Human action, helping protect and restore sections of winter habitat • Government regulations and action preserving habitat
Summer Habitat	• Expanded agriculture, eliminating milkweed • Housing or business developments and other forms of habitat loss • Very rainy summer weather resulting in shorter growing season for nectar plants • Pesticide use in agriculture and along roadways • Drought conditions which hurt both nectaring plants and milkweed	• Stable weather patterns and favourable winds • Groups of students and citizens who plant butterfly gardens and participate in citizen science • Road ditches with milkweed growing in them do not get mowed

More migration scenarios can be added using the Negative and Positive Factors chart. After the final migration, discuss how the game was realistic and what other hazards Monarchs face. Discuss how long the journey takes for a Monarch and the odds of successfully making the trip.

This activity could include a math component by counting the number of Monarchs that migrate successfully, the number that don't make it, and graphing these numbers after several migrations.

EXTENSION Symbolic Migration

Participate in a symbolic migration with Journey North! Journey North organizes a "symbolic migration" of Monarch butterflies annually and schools across the U.S. and Canada can sign up to participate with schools in Mexico. **This extension needs to be planned ahead of time.**

Participating Canadian classes create paper butterflies which are then mailed to schools in Mexico. They will arrive around November 1 (the Mexican Day of the Dead) just as the real Monarch butterflies will, and spend the winter with the participating Mexican schools.

In spring, paper butterflies return to each participating school just as real Monarchs return north. The paper butterflies that will be returned to each school are from other schools in the U.S., Canada, and Mexico, which turns this activity into a geography exercise too! For current instructions, deadlines, etc. visit: https://journeynorth.org/symbolic-migration

When paper butterflies return to your school, have students post them in the hallway with a map for the whole school to see.

Lesson 4: Warning! I'm Brightly Coloured!

Students will make paper butterflies using a template and then modify this template to make the most efficient glider.

Time Needed: 30 minutes

Materials: slide show, butterfly cutouts for Lesson 5

Ask students to think of some colourful insects and other animals. Continue the conversation by asking if students think that bright colours might help protect animals from predators.

Look at an image of a skull and cross bones on a container label and ask if they know what it means. Students will probably know that the symbol indicates the container is poisonous.

Explain that warning colouration, or *aposematic* colouration, works the same way. It is a strategy some plant and animal species use to avoid predation. A combination of reds, orange, yellow and sometimes white is an animal's way of saying "I am poisonous don't eat me" or "I will taste really bad, don't eat me!". Predators know these colours mean toxicity or poor taste and usually will heed the warning and not eat them.

See if students can remember from the first activity that Monarch caterpillars eat milkweed, which is poisonous. This is how a Monarch butterfly's body obtains poison. The colour of a Monarch tells animals to avoid eating it, and many predators will leave it alone.

Examine photos of other brightly patterned animals such as poison dart frogs, ladybugs, and coral snakes. Even a skunk's pattern warns other animals it is dangerous. People use similar strategies, for example with different kinds of traffic signs.

Hand out the cut outs that will be needed for the next activity. Have students colour them in using their best warning colours.

This is a nice video you can play for the children while they work on their art. It is a three minuet video.

BBC:
https://www.youtube.com/watch?v=Co5KIt441e4

Lesson 5: Exploring Monarch Flight

Students will learn about the unique flight of butterflies, then make paper butterflies using a template and chart the flight distances of their models. Students can modify this design to make the most efficient glider.

Time Needed: 1.5-2 hours

Materials: glider pattern, stiff paper (old file folders or construction paper), tape measure, Butterfly Glider Worksheet, scissors, glue, tape, graph paper, ruler, weight per glider (nickles, quarters, eraser, ect.). For student-designed gliders: additional paper of varying weight and stiffness, paperclips, play dough or other substances for weight.

Ask students to think about the last time they saw a butterfly fly. Did it seem to know where it was going? How did its ability to fly seem different than that of a bird? A butterfly's flight pattern might appear to be erratic, but it is not random at all. Has anyone ever tried to catch one?

Explain to students that Monarchs can travel up to 90 km a day while migrating. This is possible because Monarchs can fly without flapping their wings for certain periods of time. Can students guess how they might do this? It is done by using thermals - upward drafts of warm air - and favourable winds. Watch *The Physics of Butterfly Flight* (3 min) to see: www.insidescience.org/video/physics-butterfly-flight

Explain to students they will be examining how this works and divide the class into teams of 3.

Using the coloured cut outs from the last activity, have students build their gliders using the directions provided. Be sure they write their names on the gliders and provide each student with a Butterfly Glider Worksheet.

Before going outside, make sure someone from each team will do the following when a glider is thrown: (1) record results on data table, (2) mark the landing, and (3) measure the flight distance.

Create a launch site by drawing a long starting line in the ground. Allow enough room between groups. Before groups start recording data, each student should take a few practice flights. Then each student should throw their glider 2-5 times.

After all group flights have been recorded, have each group determine the average flight distance for each glider and then for the entire group. Have students construct a bar graph illustrating the average flight distance in comparison with others in their group. Discuss:

- What affected the distance your glider flew?
- Would this distance be increased if gliders were launched from higher up? (Can you test it?)
- How could you modify your glider to fly farther?

Encourage students to compare their gliders to real Monarchs, thinking about the lessons from the video and the angles of the front and back of the Monarch's wings. Discuss the factors that affect the efficiency of the Monarchs' glide. Are all of them reproducible in paper gliders?

EXTENSION

Have students improve the design and hold a competition with their models. They can experiment by varying the height and force from which they launch their gliders.

Directions for Butterfly Glider

Construction

1. Trace body/wing and fuselage templates (see patterns) onto stiff paper and cut them out.

2. Fold fuselage on all creases. Fold center crease of fuselage section so that flaps point up, then fold outside creases A and B down.

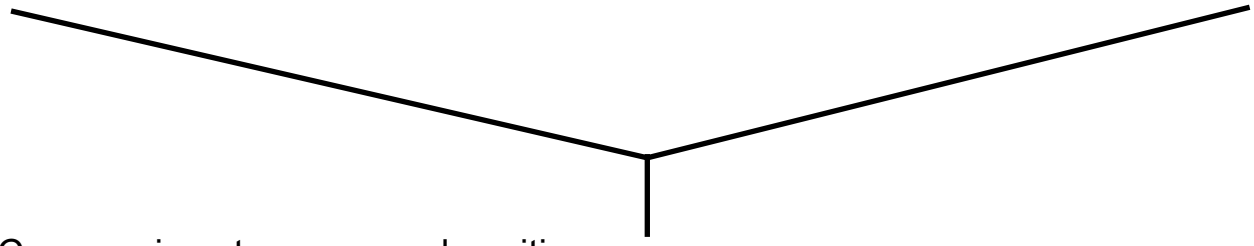
3. Place a weight on each side of fuselage front and tape them in place. This should also seal the front of fuselage.

4. Cover the entire top of both fuselage flaps with glue.

5. Align the fuselage with body/wing section and press together.

6. Allow glue to dry.

7. Crease body/wing section along the center, to allow the wings to move/flap. It should look like a butterfly would if you looked it in the eyes:



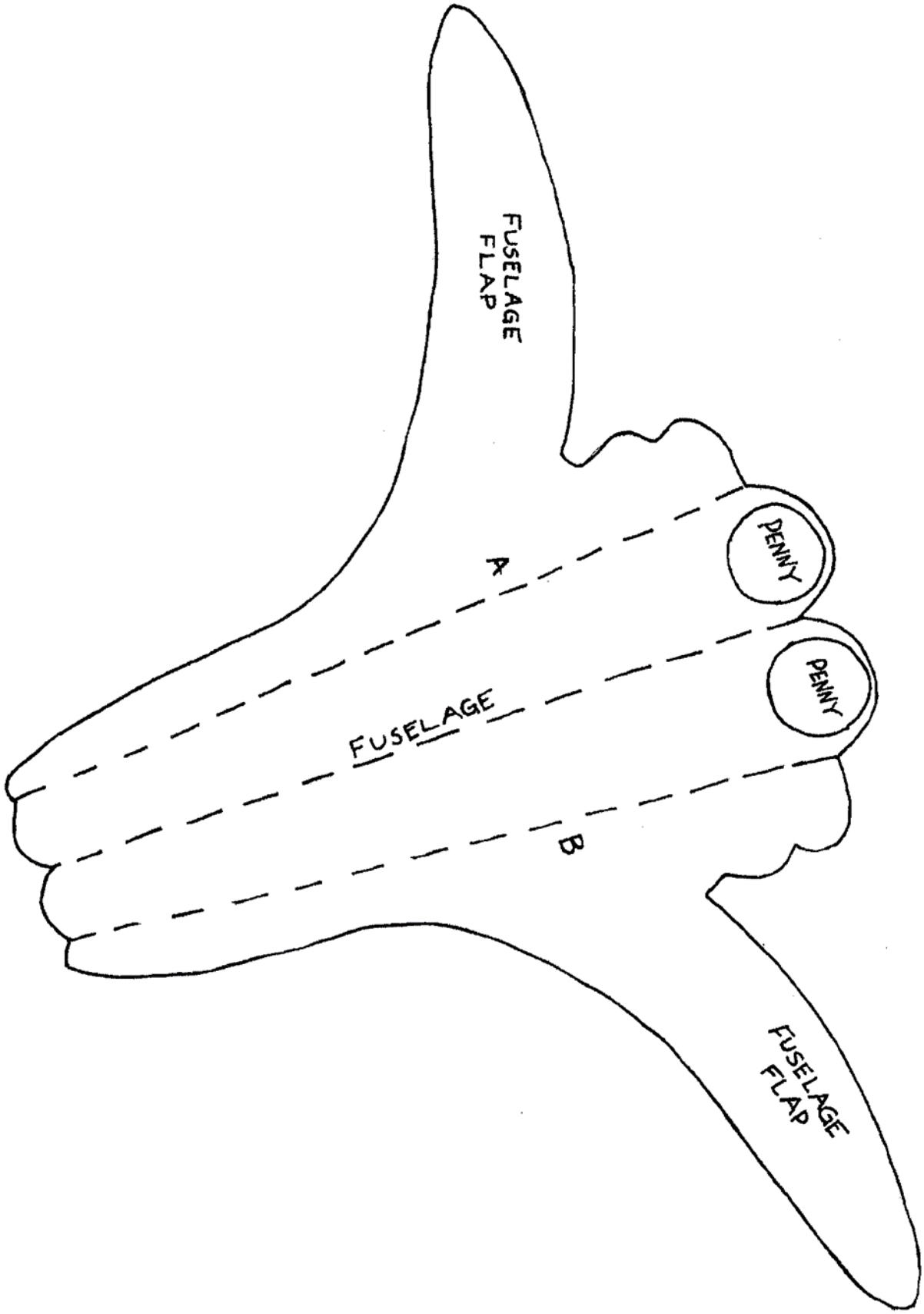
8. Crease wings to an upward position.

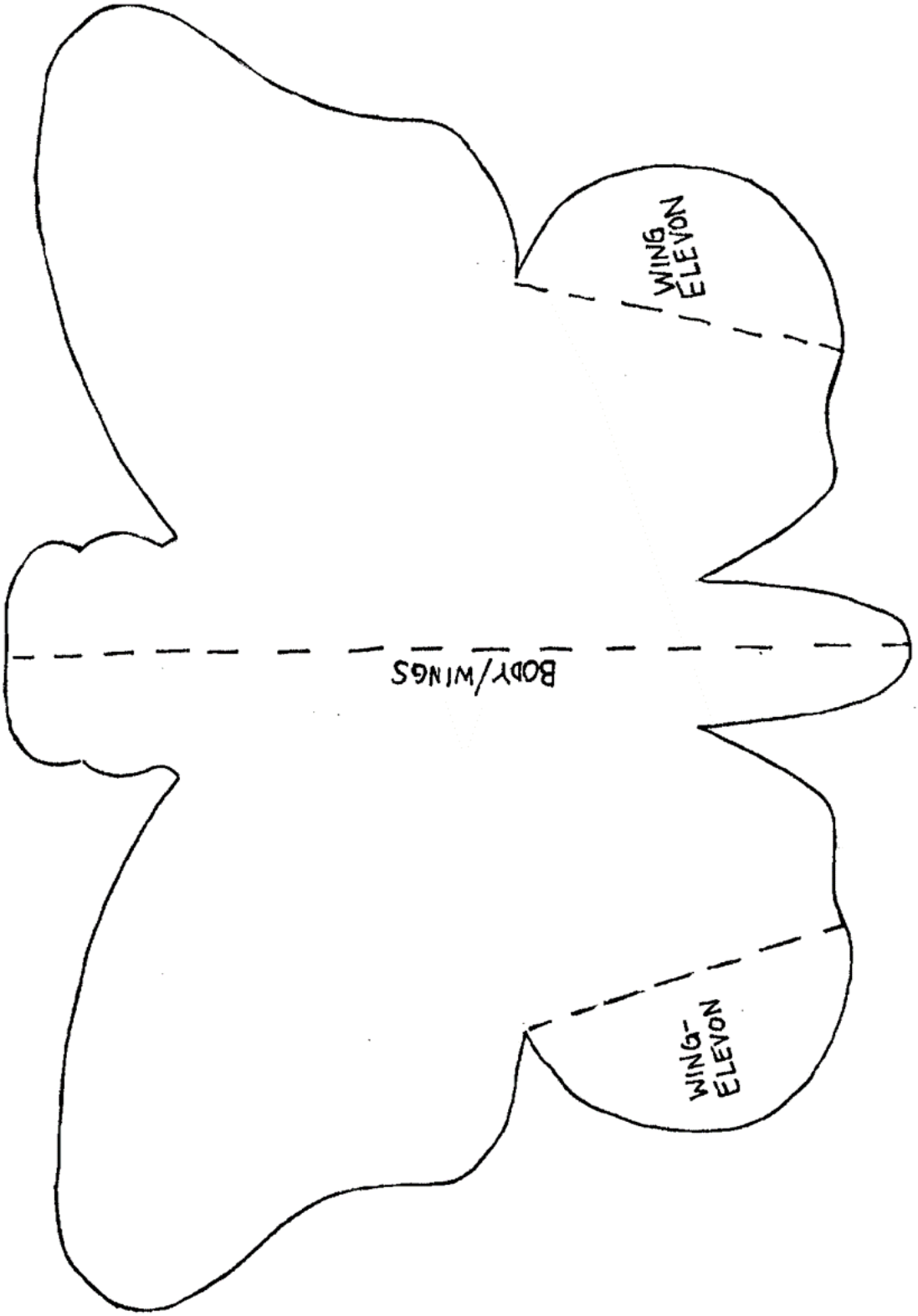
Launching

1. Hold front area of fuselage between thumb and index finger.

2. Throw with a firm toss.

3. Adjust creases between flights, if necessary.


FUSELAGE FLAP
A
PENNY
PENNY
FUSELAGE
B
FUSELAGE FLAP


WING ELEVON
BODY/WINGS
WING-ELEVON

Butterfly Glider Worksheet

Name _____

Directions: Record the travel distances of all the gliders in your group.

Launch	Student 1	Student 2	Student 3	Student 4
1				
2				
3				
4				
5				

Find the Average: Add up the distance of all five throws and write in the total row below. Then divide each total by the number of throws to determine your average.

	Student 1	Student 2	Student 3	Student 4
Total =				
Divided By=				
Average=				

1. Try varying the height from which you launch your glider. How does this affect the distance your glider flies?

2. What happens to your glider if you throw it harder?

Grade Three

Unit Outline

Time	Lesson	Location	Materials
30 mins	I Notice, I Wonder, It Reminds Me	Outdoor	None
45 mins	A Plant's Basic Needs	Indoor	3 opaque containers - one containing soil, one water, one a flashlight, one nothing - taped shut
40 min periods over 4 days	Parts of a Plant	Indoor	List broken down in each section
1 hour and 30 minutes	Plants and People	Indoor	Household items such as ketchup, cloth, after sun lotion, aspirin, postage stamp, rope, paper, sunflower oil, rubber, chewing gum, plant to product worksheet, letter-sized paper, markers, paper sleeves, dry erase markers
30 min - 1.5 hrs plus project time	The Lorax	Indoor and Outdoor	Video or book copy of Dr. Seuss' The Lorax, different materials based on student led projects

Curriculum Expectations

UNDERSTANDING LIFE SYSTEMS GROWTH AND CHANGES IN PLANTS

1.1 Assess ways in which plants are important to humans and other living things, taking different points of view into consideration, and suggest ways in which humans can protect plants

1.2 Assess the impact of different human activities on plants, and list personal actions they can engage in

2.2 Observe and compare the parts of a variety of plants

2.4 Investigate ways in which a variety of plants adapt and/or react to their environment, including changes in their environment, using a variety of methods

2.5 Use scientific inquiry/experimentation skills and knowledge acquired from previous investigations, to investigate a variety of ways in which plants meet their basic needs.

2.6 Use appropriate science and technology vocabulary, including stem, leaf, root, pistil, stamen, flower, adaptation, and germination, in oral and written communication

2.7 Use a variety of forms to communicate with different audiences and for a variety of purposes

3.1 Describe the basic needs of plants, including air, water, light, warmth, and space

3.2 Identify the major parts of plants, including root, stem, flower, stamen, pistil, leaf, seed, and fruit, and describe how each contributes to the plant's survival within the plant's environment

3.4 Describe how most plants get energy to live directly from the sun and how plants help other living things to get energy from the sun

3.5 Describe ways in which humans from various cultures, including Aboriginal people, use plants for food, shelter, medicine, and clothing

3.6 Describe ways in which plants and animals depend on each other

Lesson 1: I Notice, I Wonder, It Reminds Me...

Students use this field practice routine to think in-depth about plants as subjects of study. At their own pace, and initially without information sharing, students will develop ideas and focus on dis-covery, prompting a degree of excitement on the study of plants.

Time Needed: 30 minutes

Materials: None

Introduce or complement a unit on plant study with the I Notice, I Wonder, It Reminds Me. Sit in a circle and begin by discussing as a class:

- What does it mean to observe something?
- Who would do this regularly and well? (ex. detectives, farmers, scientists, athletes).
- What could make one person better at observing than another?
- Are you a strong nature observer?

To work together to become better observers, have everyone pick up a plant piece (already on the ground like a leaf or stick). Define what an observation is "the action or process of observing something or someone carefully in order to gain information" and encourage students to start with the prompt: I notice… This could be colour, texture, shape, smell, weight, size, and many more. Review statements which are not observations (ex. I notice… it is a leaf, it is cool, it is chewed by bugs - without seeing bugs).

Have students practice making observations out loud with a student next to them for 1 minute. Then stop and work with the other student next to them for 1 minute. Ask the class if any pairs would like to share their observations and, if needed, review any opinion or identification statements and adapt to observations.

Begin asking 'I wonder...' questions about the plant piece with partners. Students should ask as many questions as possible for 1 minute. Pairs can then share with other students for 1 minute. Groups can share the most interesting questions with the class.

Introduce the last prompt, it is something students already know, 'It reminds me of…' to describe the objects appearance or other information such as an experience. Sometimes it can be helpful to focus on one part of the object. (Ex. The veins on this leaf remind me of my fingerprints, the shape of this leaf reminds me of a heart, this stick reminds me of a movie about loggers). Once again, have students work in pairs for 1 minute, then share with the group.

Point out how much they have come to know and relate to their plant piece. Look around to see how much more there is to be discovered.

Set a boundary outdoors and allow students 15 minutes to continue their observation using new subjects such as entire plants. Encourage students to share with each other as they observe. Introduce tools such as hand lenses, containers, and journals. If some students become disengaged, draw their attention to something particularly interesting.

Conclude with a group discussion:

- What surprised students when they were observing?
- Did they observe something they have never seen before?
- Do they feel like stronger observers now?

This routine can be repeated many times in the school year, and may become a weekly routine. It is a good idea to repeat it as the study on plants, and encourage students to use their new vocabulary in observations.

Lesson 2: A Plant's Basic Needs

This activity is an introduction to the things that plants need to survive. Students will examine the four basic needs of most plants through several activities and discussion.

Time Needed: 45 minutes

Materials: 3 opaque containers - one containing soil, one water, one a flashlight - taped shut, pieces of construction paper in four colours

Arrange the students in a circle. Tell the students that they will be learning about plants' basic needs and that in each container, you've captured one thing that plants and animals need to survive.

Pass the containers around. Have students shake each, feel how heavy it is and think about what might be inside. Ask that they not say their guess out loud.

Once all three containers have been passed around ask if someone would like to guess what was in the first one. You can let some water fall out for a hint. Have another student guess what is in container two. Pour the soil into their hand and show it to the class.

Finally the trick container, plants don't need a flashlight to live. But they need light from the sun to help produce the food! There is something else in there too. Tell everyone to take a deep breath. Plants need to breath like us, the container also holds air!

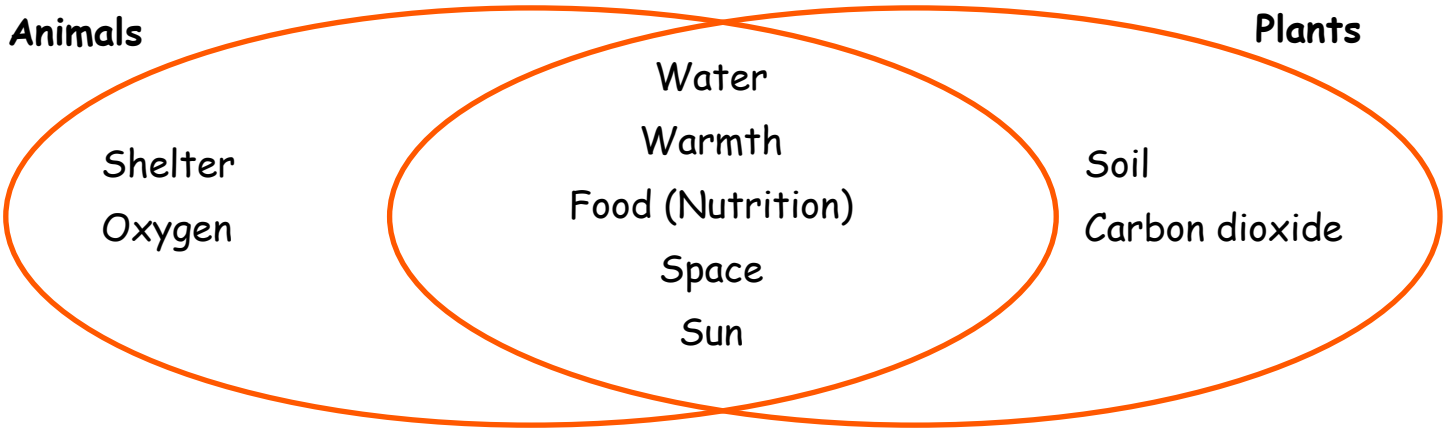
Re-cap the elements needed for plants to grow – water, soil, air, and light. Remind students that plants also need warmth (from the sun) and space – most can't grow if they're too close together.

How do these basic needs compare to what animals need to live? Do humans need these things as well? Create a Venn diagram to compare the basic needs.

Discuss how we meet our basic needs - going to the grocery store, breathing clean air, drinking water, etc. Ask students how a plant might meet its basic needs.

To demonstrate, ask several students to stand in one square meter of the classroom, mark a border if necessary. Scatter four different coloured cards or pieces of construction paper around the students - white (air), blue (water), brown (soil, nutrients), yellow (light). The students should try to pick up one of each colour of card without moving their feet - as if they are a plant rooted to the ground. If a student doesn't collect all the colours, they didn't survive as a plant.

Plant's and Animal's Basic Needs



See if the class can determine what basic need each colour represents. Then see if the class can guess which plant part utilizes each element.

Encourage students to come up with a few examples of plant based items that need air, water, sun, and soil to grow. For example, the cotton in your shirt was grown in soil and needed sun, air, and water to live. Or apples grow in orchards. Apple trees need soil, air, water, and light to grow.

Take students outside and repeat the I Notice, I Wonder, It Reminds Me activity while thinking about the plant's basic needs.

EXTENSION

Check out GBB's Healthy Soils = Healthy Plants Lesson about plants' needs and anatomy at www.gbbr.ca/lessons-in-a-backpack.

Lesson 3: Parts of a Plant

In this activity, students will learn about the different parts of plants, using milkweed as a 'model plant' that they will be focusing on. They will learn about the functions of leaves, roots, and flowers, and will look at the different forms that plant parts can take.

Time Needed: Spread lesson out, 40 minute periods over 3-4 days

Materials: listed per each section.

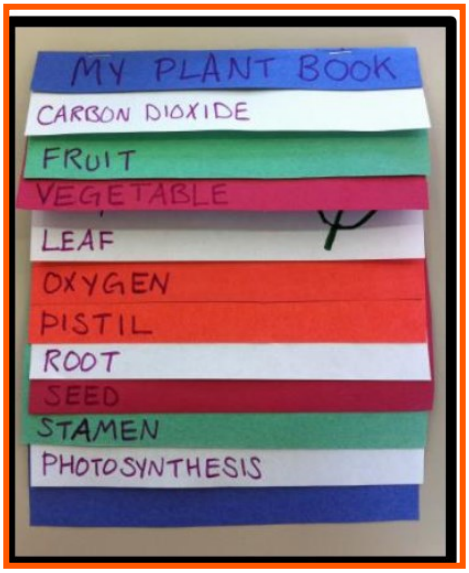
INTRODUCTION

Materials: 5 pieces of coloured paper per student, markers

Inform students that they will be learning the different parts of plants and the role each part plays in the plant's life. In order to help keep track of these parts, they'll start by making a definition flipbook that they can keep handy. Demonstrate how to make the flipbook from pieces of paper, or have one already made to show students.

Lay the coloured paper on top of one another with 3/4 inch space between each. Starting with the top sheet, fold the paper downward leaving 3/4 inch of space. Continue to fold the sheets of paper along the same fold line. Next, staple the fold line along the top to hold the pages in place.

Have students write their name on the top flap. Students can write the new vocabulary words on each tab now and record the definitions plus a small illustration as each is reviewed. Students can draw and label a plant as seen above, or can create pages in order of plant part introduction. The order in which plant parts are reviewed may depend on weather, plant availability, and student interest.



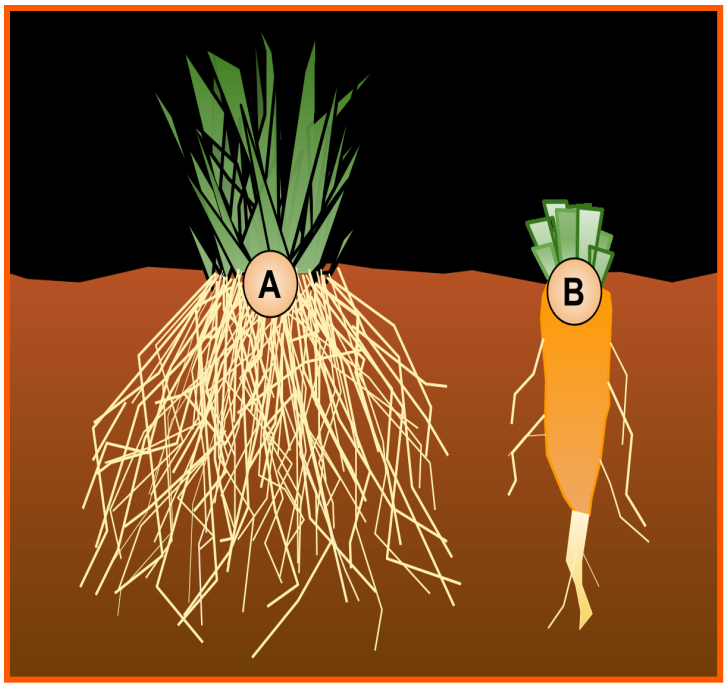
ROOTS

Materials: *examples of root types from grocery store*

Assess students' knowledge of the role of roots by asking the class what they know already about plant roots. What do plant roots look like? What do they do? Are all plant roots the same? How do the roots support a plant's basic needs?

Review the main functions of a plant's roots:

1. Anchor the plant to provide stability,
2. Bring water into the plant from the ground,



3. Store sugar and starch produced in the leaves.

Observing Root Types

Divide the class in to several groups. Provide each group with one example of a plant root from the grocery store and allow 5 minutes to examine each before rotating the examples. (Examples might be herbs, carrots, radishes, turnips, onions, potatoes). Challenge the students to make between 3-5 different observations of the roots (e.g. colour, weight, shape, length).

As a class, review the major observations about each root. Students may have already identified that some roots are large and central and others are stringy. Write the two main types on the board - fibrous and tap - and see if students can name other plants that fall into these categories.

Making Connections

While talking about fibrous and tap roots, you may wish to show examples or pictures of common milkweed and swamp milkweed and get students to categorise them. Swamp milkweed has fibrous roots, while common milkweed has a taproot.

Re-growing Plants from Roots

Explain that the class will be witnessing the stored energy in these plant's roots by "re-growing" them over the next few weeks.

Place the grocery store plant examples in jars with a bit of water on a window sill. (This works well with green onions, lettuce, carrot tops). You may want to task groups to measure and record the growth every day, keep the roots moist but not overwatered, and even take pictures of the plant every day to make a time-lapse video.

Root Wrap-Up

Travel outside with your class to observe roots in a natural space or garden. Some will be readily observable, like tree roots, while others may need to be uncovered. Dandelions are an excellent taproot example which can be carefully pulled up. Ask students why they think some plants, often "weeds", grow back after we pull them out of the ground?

LEAVES

Materials: *handful of leaves from outdoors, water, jar(s), baking soda, Photosynthesis worksheet, milkweed leaves, leaf variety image, pencil, paper*

Assess student's knowledge of leaves by asking the class what they know already about plant leaves. What do they look like? What do they do? How do leaves support a plant's basic needs? In what ways are leaves used by people?

Explain that leaves have many important roles

for plants and animals but as a class you're going to learn about two of them: their ability to turn sunlight into food for the plant and their ability to intake carbon dioxide and release oxygen.

Watching Leaves Breathe

Ask the students to remember what we're breathing in. Explain that although 'air' contains many different elements, we're relying on the oxygen to live. Plants rely on carbon dioxide in the same way. Luckily for us, plants and animals each 'exhale' what the other needs!

Use fresh leaves from outdoors, try several different types, to observe the oxygen produced from plant leaves. Divide the class into groups and provide each with a large bowl, a jar, and a 6 to 8 inch section of leaf. Task each group to fill their bowl with water and stir in 2 teaspoons of baking soda. The baking soda will provide the plants with carbon dioxide.

Have one student place the plant into a jar then lower the jar sideways into the bowl until it fills with water. Make sure no air bubbles are in the jar then turn it upside down in the bowl. Place in a sunny window or under a light.

Photosynthesis

While the plants are sitting in the window, begin to discuss the other major role of leaves: making food for the plants. Write the word "photosynthesis" on the board and explain this is the term used to describe how a plant turns sunlight, water, and carbon dioxide into food. The process is complex, essentially plants use sunlight for energy in a similar way that we use heat to change cake batter into a cake. Instead of a cake, the plant makes glucose or sugar, which provides it with the energy to grow and live. The sugar can be stored for a long time and can be eaten by animals like us!

Watch *Photosynthesis - Biology basics for children* (4:52 min) and complete the photosynthesis worksheet: www.youtube.com/watch?v=3pD68uxRLkM

After the video and worksheet are complete (allow at least 20 minutes) observe the plants. A bubble should have formed at the top of the jar and small bubbles should be seen on the leaves. Most bubbles will come from the area nearest the light. The bubbles contain the oxygen being given off by the plant!

Milkweed Leaves

To discuss how leaves can be beneficial to other creatures, talk about different animals that use leaves for food, or for habitat. Potential examples could be:

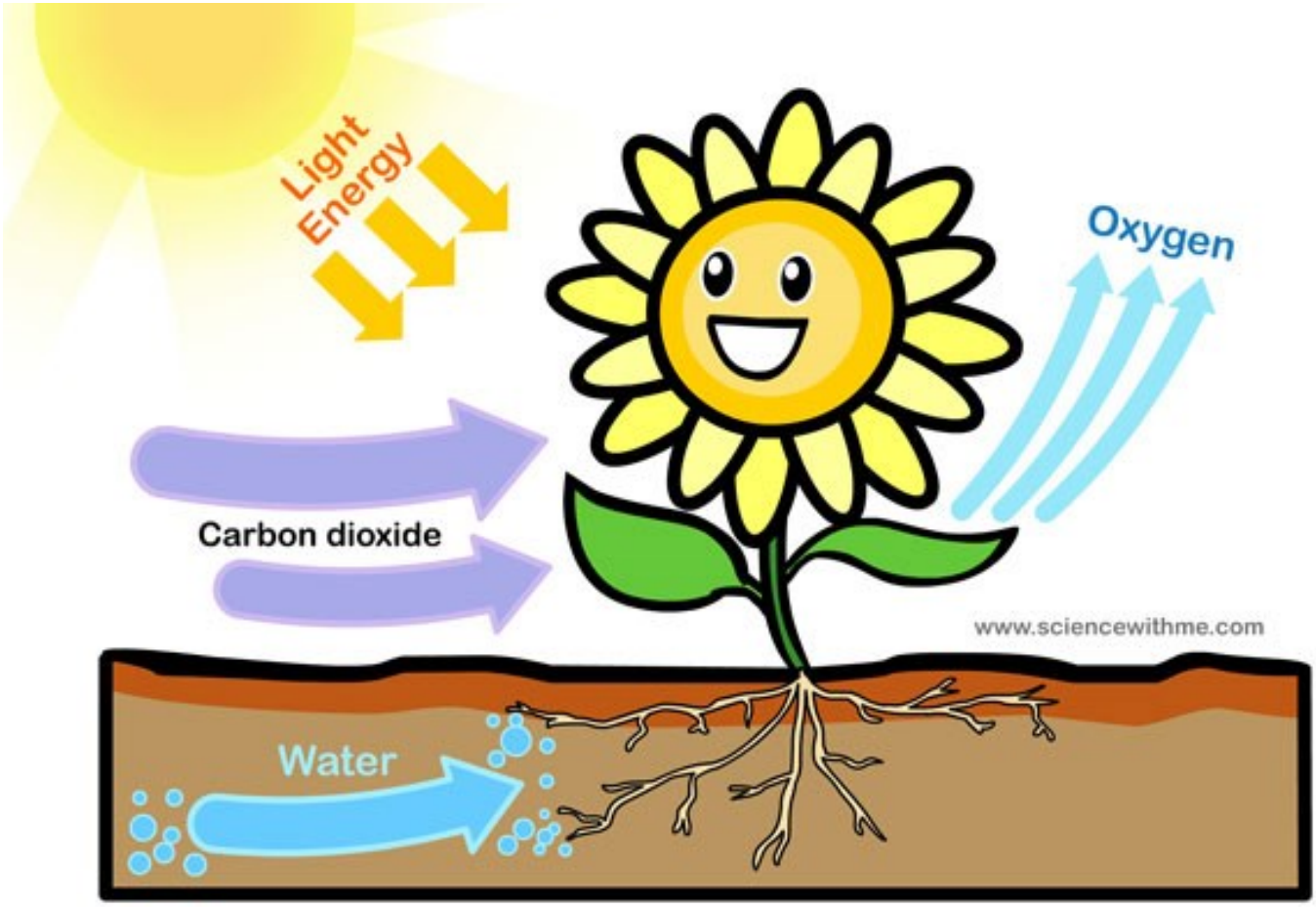
- Deer and other large wildlife that eat leaves,
- Aphids that eat leaves, and ladybugs that eat aphids,
- Caterpillars that eat the leaves, and form cocoons/chrysalis on the leaves.

After mentioning caterpillars, talk with students about how Monarch caterpillars only eat milkweed, which is why it's so important for Monarch butterflies. If you have a large patch of milkweed nearby, organize students into groups or pairs and have them rip one milkweed leaf in

Common milkweed sap

How Does Photosynthesis Work?

Using the picture as a guide, fill in the blanks in the paragraph below using the words at the bottom of the page.



Photosynthesis is a process that occurs in the leaves of most plants. These plants use _____ from the sun to convert _____ from the air and _____ from the soil into _____ to feed the plants. As a result, _____is released into the air.

oxygen	light	water	sugar	carbon dioxide

half to observe the milky white sap inside.

Tell students that this sap is mildly toxic, and eating this sap makes Monarch caterpillars (and therefore Monarch butterflies) taste bitter to animals that try to eat them, and can even make these animals sick.

Make sure that students wash their hands after touching the milkweed sap.

Leaf Variety

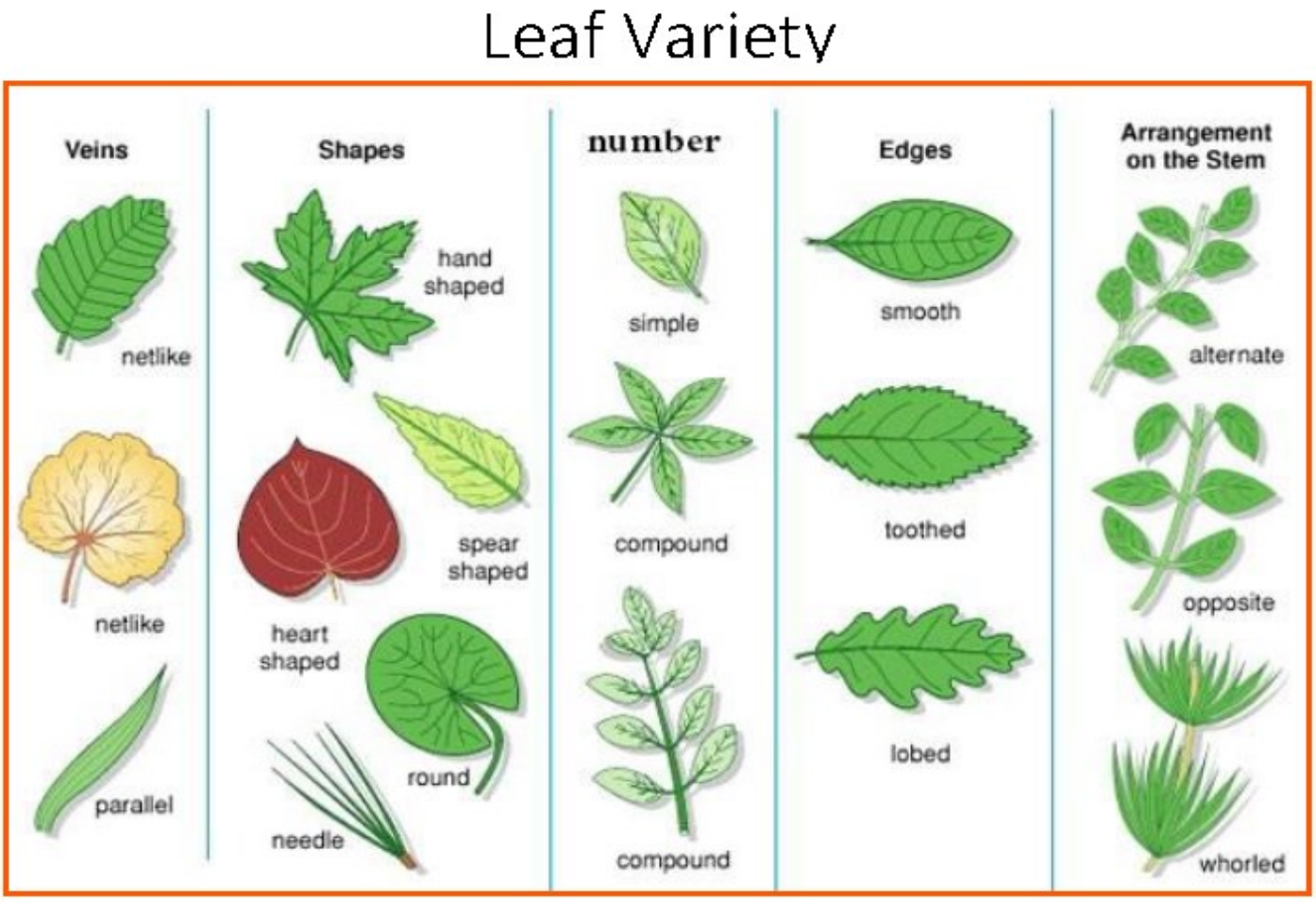
Discuss with your class how different leaves appear based on what they've seen already. Display an image like the one below which shows a variety of shapes and features. Knowing which plants produce which type of leaf is one of the ways that we can tell what type of plant we're looking at. Can students think of any examples or name any of the leaves?

Instruct the class they will be going outside to make leaf rubbings to record the variety of leaves around us. Demonstrate how to make a leaf rubbing inside first using a pencil and paper. (Hold the paper over top of the leaf with one hand, and tilting the pencil on its side, gently rub the pencil across the entire leaf. The shape and veins will transfer to the paper very well with this technique).

Prepare each student to head outside ensuring they have several sharp pencils and blank paper or a journal. Students can practice with leaves that have fallen on the ground and eventually use leaves still on a plant if they're careful not to tear them. Exploring the leaves in a school garden might show how different plant leaves can appear, and that some plants are actually closely related.

STEM

Materials: white flowers (daisies, Queen Anne's



Lace, yarrow), celery, milkweed, water, jars, food colouring.

Have a discussion with students about the function of a plant's stem. A plant's stem physically supports the leaves and flowers, and transports water and nutrients from the roots up to the leaves. Once the leaves use this water and nutrients to create food for the plant, the stem transports the food to the rest of the plant. Use celery and a white flower (e.g. Queen Anne's Lace) to demonstrate how plant stems absorb water and nutrients. You will need jars of water and food colouring to represent nutrients for the plant.

Day 1

Place celery and Queen Anne's Lace cuttings in glasses of water mixed with food colouring. Make sure to cut off the bottom tip of each stem. Leave these cuttings overnight. Try this with milkweed flowers, does the sap change colour?

Day 2

Check on the plants with the students, and have them discuss their observations. Did the colour of the celery stalk change? What about the Queen Anne's Lace flowers?

Explain to the students that the celery and Queen Anne's Lace use 'capillary action' to bring water and nutrients (the food colouring) up to the plant's leaves and flowers.

FLOWERS

Materials: flower diagram, flower tally sheet , pencils, clip boards

Show a diagram of a simple flower (lilies and daffodils work well) and review the parts of the flower with students including petals, stamen, and pistil.

Explain that flower petals act as an attractant for pollinator animals (such as birds or insects) and that the stamen produces pollen, which sticks to pollinators as they feed on the flower's nectar. As the pollinator moves to another flower to continue feeding, the pollen becomes attached to the flower's pistil, and the flower is pollinated. Only pollinated flowers can produce viable seeds. Some plants are pollinated by wind, meaning they do not need animals to help them.

Task students to draw a flower in their flip book, and have them label the petals, stamen, and pistil.

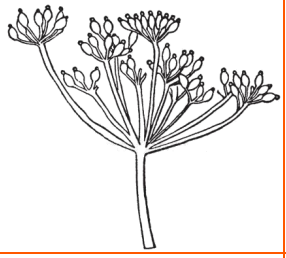
Once students have drawn the basic parts of a flower, discuss the different shapes of flowers. Does anyone have a favourite flower and what does it look like? What colours can flowers be? Why are some small and some very large? Why do some plants have multiple flowers but others only have one?

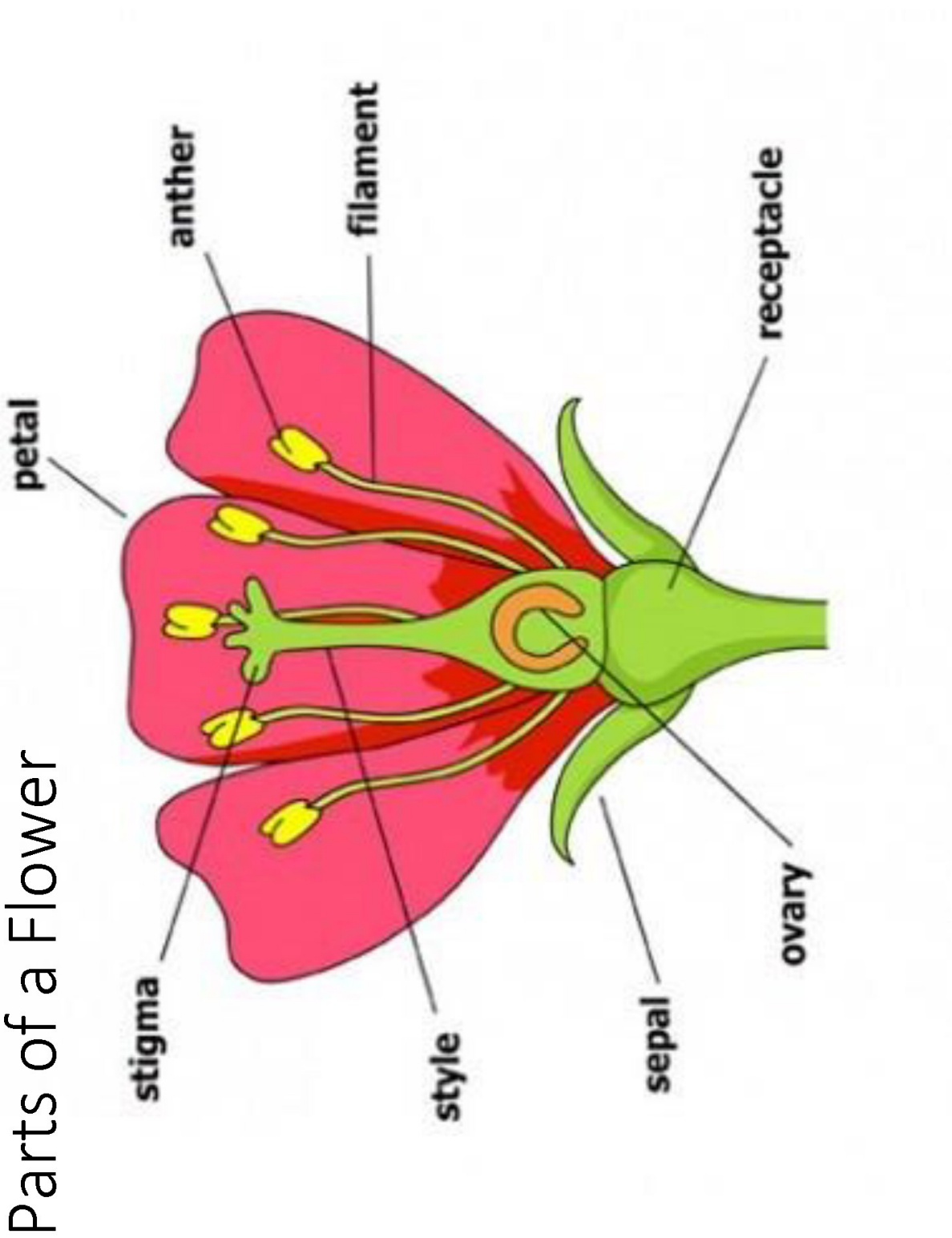
Talk about different types of flower arrangements students have seen, and prepare students to go outside.

Once students are outside, hand out tally sheets and pencils to groups, pairs, or individual students. Hike around a garden or natural space and tally the different types of flowers students see. Once back inside, have students count and share the plants that they tallied to see which kind is most common and least common. Might

Flower Tally Sheet

Keep a tally of types of flowers you see! Name:_____

Flower Types	Tally of Flowers	Number of Flowers
Tubular *Long flowers that appear to have a single, tube shaped petal.* 		
Umbel *Many small flowers branching from a single spot on the stem.* 		
Regular *A single flower head with a group of petals.* 		
Panicle *Flowers branching out from the sides of the stem.* 		
Spike *Multiple flowers on the stem of the plant.* 		
Other *Do you see other types of flowers?*		


Parts of a Flower
petal
anther
filament
receptacle
stigma
style
sepal
ovary

this change if done during different seasons?

Bonus

Check out the *Pollination Power* Lesson in a Backpack at gbbr.ca/lessons-in-a-backpack.

SEEDS

Materials - pictures of milkweed, umbrella, spray bottle, flashlight, seed examples.

Show students pictures of milkweed throughout its maturation, and discuss as you go through them how the milkweed is changing (e.g. sprouting, flowering, seedpods).

Ask students if they know that seeds travel. If so, why might a seed need to travel? Seeds need to move away from their 'parent plants' because the parent plants have the same *basic needs* and they will compete with other plants to get them.

To demonstrate this, have a student pretend to be a plant and stand underneath an umbrella. Next, have several objects (e.g. pinecones, seed packets, beanbags) scattered around the student under the umbrella to act as seeds.

Take the spray bottle and spray the umbrella with water, to show that seeds won't get the water they need if they stay too close to the plant they come from. Use the flashlight to show the same concept for sunlight. Have students discuss different ways that seeds could travel away from the host plant.

At this point, bring out the seedpod of a milkweed plant, and show students the seeds inside. They should notice that the seeds have fluffy tufts on them, and you can discuss how milkweed seeds are propagated by floating away on the wind. See if students can come up with any other seeds that spread with wind (such as dandelion seeds).

Using different seeds (milkweed, thistle, pinecones, sunflower seeds), talk with students about the different ways that plants spread their seeds.

- Wind travel - milkweed seedpods move with the wind by using fluff to catch a breeze and carry them.
- Burrs or hitchhikers - thistle's barbs attach to the fur of passing animals, like Velcro, and are transported away.
- Fruits - many seeds are eaten by animals, and transported in their stomachs before animals defecate, releasing seeds. Can students think of seeds they have seen while eating fruits?

If it is fall, take students out on a walk to see what sort of seedpods they can find. Take pictures with iPads, and create a class collage of seedpod photos.

Lesson 3: Milkweed

Lesson 3: Milkweed

Lesson 3: Milkweed

Lesson 3: Milkweed

Lesson 3: Milkweed

Lesson 4: Plants and People

Students will identify common uses for plants and assess ways in which certain plants are used by people and animals. Students conduct an experiment on a plant's ability to produce oxygen.

Time Needed: 1 hour and 30 minutes

Materials: household items such as ketchup, cloth, after sun lotion, aspirin, postage stamp, rope, paper, sunflower oil, rubber, chewing gum, plant to product worksheet, letter-sized paper, markers, paper sleeves, dry erase markers

Begin a class discussion with the question: What do plants provide for people?

See how many uses students can generate and list answers on the board. Remind students that even though something doesn't look like a plant, it may have come from a plant. (Example: paper doesn't look like a tree, however it was made from wood pulp; meat doesn't look like a plant but it is from animals that ate plants).

Once the list contains 10 or more items, ask the class if they notice any themes? See if the class can generate the idea that the list can be broken into the following categories: food, fiber, shelter, medicine, and fuel. (You may point out how this list is very similar to the categories of basic needs).

Place the household objects around the classroom and divide the class into small groups or pairs. In a science journal or worksheet with list of items, have students move from item to item to match what plant(s) it comes from.

Explain to the students that not only do trees provide us with many of these products and resources, but they also provide shade, protection from the wind, habitats for animals, and improve the quality of air. Plus they are beautiful!

Have students think of their favourite place to be outside. This could be their yard, the area around the school, or a favourite fishing hole. Once students have chosen a place, give them time to draw in on a letter-sized piece of paper without any trees, shrubs, or flowers included in their image.

PRODUCT	PLANT SOURCE
Ketchup	Tomato
Rubber	Rubber Tree
Chewing Gum	Sapodilla Tree
Cloth (Cotton)	Cotton Plant
After Sun Lotion	Aloe Vera
Aspirin	Willow Tree
Postage Stamp (for sticky back)	Acacia Tree
Rope	Agave Sisalana
Paper	Wood Pulp
Sunflower Oil	Sunflower

Once completed, put the drawings into the paper sleeves. With a dry-erase marker, have the students draw the trees, shrubs, and flowers into their scene. When they are finished, they can take the drawing in and out of the sleeve to compare the space with and without trees.

EXTENSION

Read *Nanabosho and the Butterflies* by Joe and Matrine McLean. Discuss what the importance of plants and animals in this book were. What do students think the meaning of the story is? What does the story teach us?

Plants & People

Name:_____

PRODUCT	PLANT SOURCE
Ketchup	
Rubber	
Chewing Gum	
Cotton Cloth	
After Sun Lotion	
Aspirin	
Postage Stamp (for sticky back)	
Rope	
Paper	
Sunflower Oil	

WORD BANK:

Tomato
Rubber Tree
Sapodilla Tree
Cotton Plant
Aloe Vera
Willow Tree
Acacia Tree
Agave Sisalana
Wood Pulp
Sunflower

Lesson 5: We Speak for the Trees!

Students will learn the story of Dr. Seuss' The Lorax and then think critically about the meaning of the story and how it applies to their community. Students will pick a project to expand on their ideas.

Time Needed: 30 min - 1 hour and 30 minutes

Materials: copy of the Lorax book or video, additional materials per student group based on project selected.

Read (and/or watch if there is time!) Dr. Seuss' *The Lorax* with the class.

Following the viewing or reading, challenge students to consider the following questions. Students may engage in a class discussion, in group discussion, or record their thinking in journals.

- What motivated the Once-ler? (human wants/ needs, industry)
- What change did we observe in the environment during the story?
- What was the environment like before industry? What about after industry?
- Can you think of examples of this that you've heard of?
- What is the message of the story?

Students will make connections between the Lorax and their community. Discuss with class:

- What resources do we have in our community?
- How are they being used?
- How are they being sustained? What can we do to implement sustainability?

Students, individually or in pairs, will choose a resource in the community and become an advocate for their resource similar to how the Lorax was an advocate for the trees. Students will outline uses of the resource and the impact of the resource and what would happen if we no longer had it. They may choose to present their ideas in one of the following mediums presented on this picnic blanket:

Record a Podcast	Create a PowerPoint presentation	Write a Photo Essay
Make a Collage & Summary Page	Create a News Cast	Create a Dramatic Skit
Make an Informative Poster	Student idea approved by the teacher.	Build a Model & Summary Page

Resources and Further Reading

READING FOR GRADES 1-3

Hurry and the Monarch by Antoine O'Flatharta

Monarch and Milkweed by Helen Frost

Monarch! Come Play With Me by Ba Rea

Monarch Butterflies Life Cycles by Julie Murray

Monarch Magic!: Butterfly Activities & Nature Discoveries by Lynn Rosenblatt

National Geographic Readers: Great Butterfly Migrations by Laura Marsh

The Butterfly Book by Kersten Hamilton

The Life Cycle of a Butterfly by Angela Royston

RESOURCES FOR GRADES 4+

Chasing Monarchs: Migrating with the Butterflies of Passage by Robert M. Pyle

Learning from Monarchs – A Teachers Handbook by Ba Rea

Monarch Butterfly: A Wonder of Nature edited by Juan C. Morales and Salvador F. Crotte

The Amazing Monarch: The Secret Wintering Grounds of an Endangered Butterfly by Windle Turley

The Incredible Journey of the Butterflies, PBS Home Video www.pbs.org/wgbh/nova/butterflies/

The Last Monarch Butterfly: Conserving the Monarch Butterfly in a Brave New World by Phil Schappert

The Monarch Butterfly: Biology and Conservation by Karen S. Oberhauser and Michelle J. Solensky

The Monarch Butterfly: International Traveler by Dr. Fred Urquhart

The Monarch Butterfly: Uniting a Continent by Karen Oberhauser, Monica Missrie, Eduardo Rendon and Eligio Garcia Serrano

LESSON REFERENCES

Flight of the Butterflies: Educator Guide
www.flightofthebutterflies.com

Fondo Mexicano para la Conservacion de la Naturaleza
http://fmcn.org/?lang=en

Maryland Science Center
www.marylandsciencecenter.org

Monarchs in the Classroom
www.monarchlab.org

Monarch Watch
www.monarchwatch.org/

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GEORGIAN BAY BIOSPHERE
MNIDOO GAMII
Spirit of the Water