

Pollination Power

Understanding the Role of Pollinators in the Environment and Food Production



GEORGIAN BAY
BIOSPHERE RESERVE



Honeybees (Peter Istvan)

Description

Through this lesson, students will recognize that pollinators play an important role in wild plant growth and food production. They will gain an understanding of the parts of plants involved in pollination, and of the way pollinators aid in plant growth by dispersing pollen. They will gain an appreciation for the diverse types of pollinators that exist in the wild in Canada.

Students will recognize that people need pollinators for food production. Students will discuss ways that human activities can threaten pollinator survival, and consider actions they can take to conserve pollinator species.

Grade Level: 3

Learning Environment:

- Classroom
- Outdoor Area (School yard, garden)

Prep Time: 20 minutes (print handouts).
Test audio/video. Fill containers with water, setting up relay race

Length of Lesson: 1 hour (plus optional extension activities)

Key Vocabulary: pollen, pollinator, nectar, anther/stamen, stigma/ovule, native bees, honeybees,

Staffing: 1 educator

Materials:

1. *Are You A Bee?*
 2. *Insects (Golden Guide)*
 3. One copy of *Wildflowers (Golden Guide)*
 4. Four 1L containers
 5. Teaspoon
 6. 16 artificial flowers
 7. 16 cups (250ml)
 8. 35 3mL pipette per student
 9. A copy of the *Pollinator Observation Sheet* (see page 11)
 10. USB with Power Point Presentation (to present in-class, or at/by Apiary staff)
- Optional: student pencils, paper, clipboards
Kit available from the NNDSB Resource Centre

Groupings:

- Whole class
- Small groups of 2-3

Teaching/Learning Strategies:

- Discussion
- Observing and recording
- Kinesthetic games

Expectations: Grade Three Science Curriculum: Growth & Changes in Plants

1. Relating Science and Technology to Society and the Environment

1.1. Assess ways in which plants are important to humans and other living things, taking different points of views into consideration (e.g. *the point of view of home builders, gardeners, nursery owners, vegetarians*), 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 to minimize harmful effects and enhance good effects

3. Understanding Basic Concepts

3.3 Describe the changes that different plants undergo in their life cycles (e.g. *some plants grow from bulbs to flowers, and when the flowers die off the bulb produces little bulbs, that will bloom the next year; some plants grow from germination of a seed to the production of a fruit containing seeds that are then scattered by humans, animals, or the wind so that new plants can grow*)

3.5 Describe ways in which humans from various cultures, including Indigenous people, use plants for food, shelter, medicine, and clothing (e.g. *food - from rice plants; houses for shelter - from the wood of trees; medicines - from herbs; clothing - from cotton plants*)

3.6 Describe ways in which plants and animals depend on each other (e.g. *plants provide food for energy; animals help disperse pollen and seeds, and provide manure that fertilizes the soil in which plants grow; plants need the carbon dioxide that animals breathe out, and animals need the oxygen that plants release into the air*)

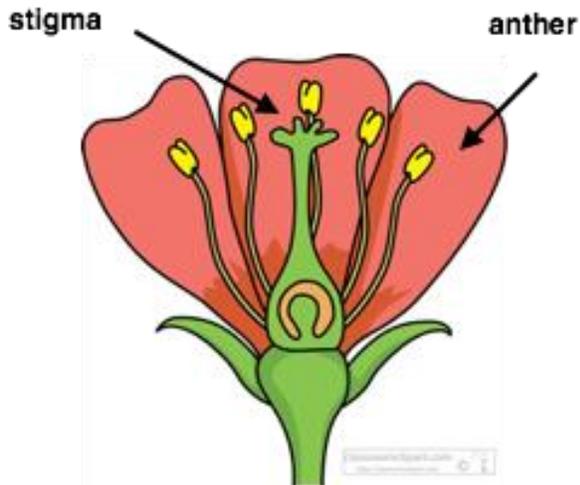
3.8 Identify examples of environmental conditions that may threaten plant and animal survival (e.g. *extreme heat and cold; floods and/or droughts; changes in habitat because of human activities such as construction*)

Lesson Outline

Time	Activity	Location	Materials
20-30 min.	Introduction	Indoor	YouTube Video – <i>The Beauty of Pollination</i> (4:19m) Book – <i>Are You A Bee?</i>
20-30 min.	Busy Bee Race	Indoor/ Outdoors	1 teaspoon 4 1L jars representing hives 16 artificial flowers and 4-ounce nectar containers 1 3mL pipette per student
15 min.	Bee Free Picnic	Indoor/ Outdoors	Pencil and paper
20-30 min.	Meet Our Bees	Outdoor	Pollinator Observation Sheet <i>Insects (Golden Guide)</i>
15 min.	Save Our Bees	Indoor	Pencil and paper

Background:

Flowering plants reproduce through a process called **pollination**. Flowers produce a powder-like material called **pollen**. Pollen is produced in the **anther** of a flower. To produce a **seed** inside the plant, pollen must travel from the anther to the **stigma**. This can happen by wind, water, or by animals called **pollinators**.



Pollinators are **animals** that visit flowers in search of food like **pollen** or **nectar**. While visiting a flower, tiny pollen grains stick to the animal's body. When the pollinator moves to another flower, the pollen grains are transferred to the stigma.

What is nectar anyway?

Nectar is a sugary liquid produced by plants specifically to attract pollinators. Honeybees use nectar in honey production.

Food Facts

People depend on pollination to grow crops. **One out of every three** bites of food you take depends on pollinators doing their jobs! Over two-thirds of crops benefit from bee pollination, including favourites like **strawberries, apples, cucumbers, and blueberries**. Wild bees play an important role in crop pollination. Wild bees can pollinate some crops more efficiently than honeybees.



Crops that are pollinated by bees produce better fruits! Strawberries, blueberries and coffee plants that are pollinated by bees produce bigger fruit. Pollination by bees also creates strawberries that take longer to rot, making them last longer after being harvested

Bee Facts

The most famous bee is the **European honeybee**; these bees were brought to Canada from Europe to help produce honey and to pollinate crops. However they're not the only bee hard at work pollinating flowers. There are over **800** species of **wild native bees** buzzing around Canada! These include the **bumblebee** (of which there are 40 species), as well as **leaf-cutter bees** and **mason bees**. Many native bee species live alone or in small colonies, burrowing tunnels into the ground or decaying wood to make their homes. Bees that live alone rarely sting because they don't have a hive to protect.

The Case of the Disappearing Bees

Sadly, bees are disappearing in the wild. There are many reasons why bees are dying off, and scientists are still studying all the threats to bees to best figure out how to help them. One reason bees are disappearing is because of **pesticide** use. When farmers spray their fields with pesticides to kill pest insects, bees can get sick and die as well. Another reason is because of **habitat loss**. Bees need natural habitat to build their hives, dig burrows, and forage for nectar and pollen. Lawns, roads, pavement, and buildings all remove natural bee habitat.

Teaching and Learning:

Part A: Introduction to Pollination

In class teaching/learning (20 minutes)

1. Lead a discussion in a **Knowledge Building Circle*** to assess what students know and would like to learn about pollinators. Show students the video *The Beauty of Pollination: Moving Art* to help generate discussion. Ask questions like: *What do you know about pollination? What animals did you see in the video? What were the animals doing? What types of plants did you see? How were the animals interacting with the plants?*
2. Explain the basics of pollination as detailed in the Background section of this lesson plan.
3. Read to the class the book *Are You A Bee?* by Judy Allen.

** Knowledge Building Circles (KB Circles) places students in a circle for open discussion on a subject. The arrangement promotes listening and sharing of ideas.*

Part B: Busy Bee Race

Indoors or outdoors teaching/learning (30 minutes)

This activity is best done in a location where students are able to run.

1. Explain to class that European honeybees are some of the busiest pollinators. Bees fly from flower to flower gathering **nectar** and **pollen** to bring back to their hive for food. Back at the hive, nectar is placed in combs and transformed into something delicious - honey!
2. Discuss with class the amount of work that goes into turning nectar into honey for bees and people to eat. *Pass around the one pound container.* Explain that the average Canadian eats a little over **1 pound of honey** every single year! Honeybees have to visit and collect nectar from over **2 million flowers** to make this one pound of honey! That's a lot of pollinating!

3. *Pass around a teaspoon.* A bee can only make about **1/12 of a teaspoon** of honey in her lifetime. This means lots of bees have to work together to make honey. It takes **565 bees** to make 1 pound of honey!

4. Tell the class that to get an idea of the amount of work that goes into making honey, they are going to participate in the **Busy Bee Race**. Run the **Busy Bee Race**.

5. After completing the **Busy Bee Race**, ask children what they learned from the experience. Discuss the fact that students were required to make multiple trips to different flowers to collect enough nectar to transform into honey. Bees work very hard to make just enough honey to feed one single person, never mind feeding themselves! Remind students that every time they visited a flower, they were also acting as pollinators by collecting pollen and transferring it to another plant.

Busy Bee Race Instructions



Materials

1 stopwatch
1 pipette per student (3mL approximately)
representing what the BEE carries
4 containers that hold 1L (each a 4-cup measure)
representing HIVES
16 large artificial flowers
16 small containers (each a 1 cup measure)
4L of water divided into the 16 small cups,
representing NECTAR

1. Set up the race course by creating 16 flower stations with 1 artificial flower and 1 cup of nectar (water) in various locations around the playing field. Place the hive(s) at a starting location.

2. Tell the students that they are honeybees collecting nectar to turn into honey. They must run to a flower station and fill their pipette with “nectar” and then fly back and deposit their nectar into their hive (show them clearly the HIVE container).

3. Bee Teams:

OPTION A – Collaborative Group: The “Queen Bee” teacher will time the whole group to see how long it takes them to fill up their hive with nectar.

OPTION B – Divide into Teams: The first team of bees to fill up their hive and collect 1L of honey wins! On your marks bees, get set, fly!

* Depending on how far the flower stations are positioned, it can take 10 students running full speed over 10 minutes to fill just 1 cup of the hive container! That would take 40-60min to fill the full 4-cup (1L) measure. Adjust the game according to your schedule.

Part C: Bee-Free Picnic

In class or outdoor teaching/learning (15-20 minutes)

This activity goes well with a school's nutrition/snack break.

1. Ask the class to remember what they learned from the **Part B Busy Bee Relay**. That activity showed bees must visit millions of flowers to collect pollen and nectar. Tell the class that when the bees visit a flower, they pollinate that flower so it can produce seeds.
2. Share with class the material covered in the **Background: Food Facts** section (page 3). Tell the class that one out of every three bites of food people eat comes from pollination. If bees were to disappear, there would be fewer fruits and vegetables for us to eat. Run the **Bee-Free Picnic** activity to learn about how food would change if there were no bees.

Bee-Free Picnic Instructions

1. Ask the students to imagine they will be attending a picnic. There will be hamburgers and hot dogs to eat at the picnic. The students must **create a menu** for their picnic. They must think about what they would like to put on their hamburger/hot dog, what they would like to drink, and what sides and desserts they would like.
2. Once their menus are designed, explain to the students that most food that we eat relies on pollination from bees to grow. Show the class the list of foods that need help from bee pollination to grow. Ask them to remove any menu items that are on the list.

We Need Bees to Make These Foods:

<i>Tomatoes</i>	<i>Onions</i>	<i>Cucumbers</i>	<i>Cacao bean (chocolate)</i>
<i>Pumpkins</i>	<i>Oranges</i>	<i>Lemons</i>	<i>Vanilla beans</i>
<i>Almonds</i>	<i>Watermelons</i>	<i>Apples</i>	<i>Blueberries</i>
<i>Cherries</i>	<i>Cranberries</i>	<i>Cantaloupes</i>	<i>Carrots</i>
<i>Avocados</i>	<i>Mustard</i>	<i>Coffee</i>	<i>Honey</i>
<i>Bell peppers</i>	<i>Chilli peppers</i>	<i>Cooking oil (sunflower, canola)</i>	

3. Ask the class to think of all the food we couldn't make if there were no bees. Without tomatoes, we have no ketchup, without chilli peppers there is no salsa. Without cacao beans, we can't make chocolate ice cream, chocolate chip cookies or chocolate cakes! We won't be able to make chips or french fries without cooking oil. Food would be far less tasty and nutritious without bees.

Part D: Meet our Pollinators

Outdoor teaching/learning (30 minutes)

Visit a school/yard/school garden/local garden. Explain any school safety guidelines for outdoor activities. Instruct students on proper behaviour around bees: respect the animals, hold still and don't scare the bees if they fly close to you. Be aware of any students with allergies to bee stings.

1. Tell class that now that they have learned how important bees are for pollinating flowers and producing our food, it's time to go out and see these animals in action.
2. Introduce the difference between European honeybees and native bees, as detailed in the **Background: Bee Facts** section. Explain many types of bees are important for pollination.
3. Go outside and divide students into small groups of 2 or 3 and pass out the "Pollinator Observation Sheet". Have students choose a **flowering plant** and observe for 1 minute. Record any pollinators that visit the plant during that time. Use the insect guide, **Insects (Golden Guide)** that is provided in the kit to help identify any animals you see. Switch plants and repeat observations.
4. Discuss results with class. *What type of animals did you see? What flowers were visited the most from pollinators? What colours were the flowers?* Remind class that many native species of bees, flies, and butterflies help pollinate flowers in Canada.

Part E: Save our Pollinators

In class teaching/learning (15 minutes)

1. Explain to class that both honeybees and wild bees are disappearing in Canada. Ask the class to come up with some ideas for why the bees are vanishing.
2. Tell class about the problems with pesticide use and habitat loss as detailed on page 4.
3. Ask class to come up with some ways to protect bees. Ideas can include: not using pesticides on lawns and gardens, planting flowering plants to feed the bees, and not killing bees when students see them at their homes and schools.



After the lesson is complete, it's a great idea to have students plan projects to help protect bees. Students can research and plan their own projects, or you can complete one of the extension activities provided below. Bee creative and have fun!

Extension Activities

I. Create a Pollinator-Friendly Garden

One way to help bees and other pollinators is by planting a pollinator garden at your school or another community space. This will be a pesticide-free habitat where bees, birds and butterflies can collect pollen and nectar.

A pollinator garden doesn't need a lot of space to thrive. Your class could design and create a small garden, or even just choose some containers of plants that attract pollinators to place outdoors.

Think about what types of plants will work best in your garden. Pollinator gardens should be filled with **native plants** - these are types of plants that are found naturally in your area. Native plants are adapted to grow in the soil and climate of your region so they will be easier to maintain. As a bonus, pollinators will be more attracted to native species! Here are some of our favourites, but you can get ideas from local gardeners as well.

Spotted Joe Pye Weed (Eupatorium maculatum): An excellent low-maintenance choice to bring butterflies to your garden

Swamp Milkweed (Asclepias incarnata): Monarch butterflies, hummingbirds, and bees are all pollinators that will visit swamp milkweed for nectar

Cardinal Flower (Lobelia cardinalis): Ideal for attracting hummingbirds to your garden



A beehive at the Canadore Community Apiary

II. Plan a Field Trip to Canadore Community Apiary

Canadore College, West Parry Sound Campus is home to the Parry Sound and Area Community Apiary which is open for visits from elementary and secondary schools and the public. Classes can visit a working beehive to learn how a beekeeper looks after a hive and harvests honey. Students can also explore a pollinator-friendly garden next to the beehives. Finally, students will get a chance to taste a sample of honey. If you are interested in visiting the apiary, please call 705-746- 9222.

What to expect at your visit to the Apiary:

a. Meet the Beekeeper!

Shows students the parts of a hive, passes around an empty frame, then a capped frame full of 1lb of honey (heavy!) to touch and smell the beeswax. Gets a volunteer into a beekeepers suit shows them the tools (smoker, prybar). What is an apiary? Why is it here? How can you help the bees?

b. Honey-tasting

At a table with paper plates, napkins, a wet cloth, jars of honey and crackers: honey from on-site and another location spread on crackers to taste the difference and discuss bee diet, habitat availability, types of pollen (spring-summer- fall). *Teachers and adults are asked to assist in serving this snack in an orderly fashion.

c. Apiary tour

The electric fence around the hives is turned off (why do we need a fence?) and you may stay outside on the path, or go into the hives, as you are comfortable. A few rules:

1. Do not stand in front of the door to a beehive.
2. Do not swat a honeybee (like you would a mosquito). If a bee lands on you, stay calm – they are gentle, observe it and then blow it off or brush it off.
3. In the apiary, move slowly, spread out. Get as close to the hive as you would like. Look for bees carrying pollen back to the hive. Look for bees fanning a hot hive. What else do you see?

d. Beekeeper certificate

When students complete their Pollination Power lesson and Apiary Tour, they will be ready to receive their beekeeping certificate. Teachers can help to put names on each one and distribute them.

III. Study Additional Pollinators

Several other pollinator species are in trouble, including the easily recognized Monarch butterfly. There are a number of Canadian resources available related to this endangered butterfly (ex. Canadian Wildlife Federation, Resources for Rethinking, David Suzuki Foundation, and Hinterland's Who's Who). Monarchs depend on milkweed, seeds are very affordable and can be easily planted by students. Additionally, Monarchs migrate thousands of miles every year. This makes a great opportunity to link activities to Geography and measurement.

For more ideas contact Georgian Bay Biosphere staff at education@gbbr.ca or 705-774-0978.

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Pollination Observation

Flower type	Flower colour	How many times was the flower visited by a pollinator? <i>Place a check every time a pollinator lands on the flower</i>	Types of pollinators <i>Write down if you see honeybees, butterflies, ants, etc.</i>