



Lesson Plan:

Plant Something Bee Friendly

Elementary

Bees (honeybees and solitary bee species) are essential pollinators for much of the world's food including many food and forage crops across British Columbia. It has been estimated that honeybees are responsible for the production of \$160 million worth of crops in BC every year.

In recent decades, there has been much talk of population declines of pollinator insects, especially in agricultural areas. In this lesson, students learn about some of the threats to bee populations, as well as ways in which they can help support bee populations through planting bee-friendly plants.

Suggested Grade/Subject Levels

Arts Education Grade 1 – 5

English Language Arts 1 – 5

Science 2, 3 and 5

Social Studies

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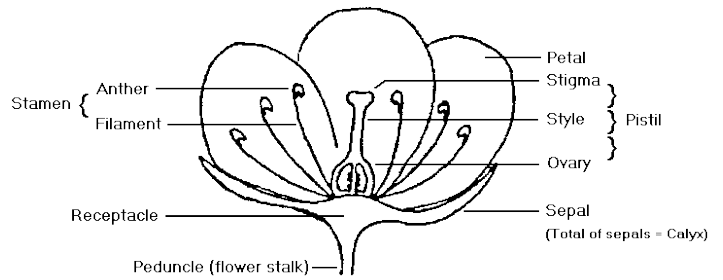
Teacher Guide

Course	Curricular Competencies	Content Connections
Arts Education Grade 1 – 3	<ul style="list-style-type: none"> • Develop processes and technical skills in a variety of art forms to nurture motivation, development and imagination • Reflect on creative processes and make connections to other experiences • Express feelings, ideas, stories, observations, and experiences through arts 	<ul style="list-style-type: none"> • Visual arts: <ul style="list-style-type: none"> ○ elements of design: line, shape, space, texture, colour, form ○ principles of design: pattern repetition, rhythm, contrast, emphasis
Art Education Grades 4-5	<ul style="list-style-type: none"> • Explore identity, place, culture, belonging through arts experiences • Connect knowledge and skills from other areas of learning in planning, creating, interpreting and analyzing works for art • Express, feelings, ideas, and experiences in creative ways 	<ul style="list-style-type: none"> • Visual arts: <ul style="list-style-type: none"> ○ elements of design: line, shape, space, texture, colour, form ○ principles of design: pattern repetition, balance, contrast, emphasis, rhythm, variety
English Language Arts Grades 1 - 3	<ul style="list-style-type: none"> • Plan and create a variety of communication forms for different purposes and audiences • Communicate using sentences and most conventions of Canadian spelling, grammar, and punctuation 	<ul style="list-style-type: none"> • Writing processes • Language features, structures and conventions: sentence structure
English Language Arts Grades 4 - 5	<ul style="list-style-type: none"> • Use writing and design processes to plan, develop, and create texts for a variety of purposes and audiences • Communicate using sentences and most conventions of Canadian spelling, grammar, and punctuation 	<ul style="list-style-type: none"> • Writing processes • Language features, structures and conventions: sentence structure and grammar
Science	<ul style="list-style-type: none"> • Ask questions about familiar objects and events • Experience and interpret the local environment • Consider some environmental consequences of their actions • Take part in caring for self, family, classroom and school through personal approaches • Communicate observations and ideas using oral and written language, drawing, or role-play 	<p>Grade 2</p> <ul style="list-style-type: none"> • First Peoples use of their knowledge of life cycles (stewardship, and sustainability) <p>Grade 3</p> <ul style="list-style-type: none"> • Biodiversity in the local environment • The knowledge of local First Peoples of ecosystems <p>Grade 5</p> <ul style="list-style-type: none"> • The nature of sustainable practice around BC’s resources
Social Studies Grade 1 – 3	<ul style="list-style-type: none"> • Use social studies inquiry processes and skills to ask questions; gather, interpret, and analyze ideas; and communicate findings and decisions • Explain the significance of local events, objects, people, or places • Recognize causes and consequences of events, decisions, or developments in their lives 	<p>Grade 1</p> <ul style="list-style-type: none"> • Relationships between a community and its environment • Roles, rights, and responsibilities in the local community • Natural and human-made features of the local environment <p>Grade 2</p> <ul style="list-style-type: none"> • Relationship between people and the environment in different communities • Rights and responsibilities of individuals regionally and globally <p>Grade 3</p> <ul style="list-style-type: none"> • Relationship between humans and their environments

Teacher Background

Broadly speaking, plants are eukaryotic organisms characterized by their ability to produce their own food. While the Plant Kingdom includes mosses, vines, trees, grasses, and ferns, agriculture is almost entirely dependent on angiosperms, which provide virtually all of our plant-based food, as well as a large amount of livestock feed. Angiosperms are distinguished from other seed-producing plants by characteristics such as flowers and the production of fruits that contain the seeds; in fact the term angiosperm actually means enclosed seed (Greek, angio = case or casing, sperm = seed).

Flowers are the reproductive apparatus of angiosperms, functioning to ensure fertilization of the ovule (egg) by the pollen (sperm), and development of the fruit (containing seeds). There are four main flower parts in angiosperms: sepals, petals, stamen, and pistil. The stamen is considered the male portion of the plant and the pistil is considered to be the female portion:



1. Sepal – green, leaf-like structure that protects the budding flower
2. Petal – colorful and often scented part of the flower that attracts pollinators
3. Stamen – the part of the flower that produces pollen. Consists of:
 - a. Filament – stalk that holds up the anther
 - b. Anther – sac that contains pollen
4. Pistil – contains the ovary containing the ovule. Consists of:
 - a. Stigma – the tip of the carpel that is sticky in order to collect pollen
 - b. Style – the slender neck-like portion of the carpel that leads to the ovary
 - c. Ovary – structure at the base of the carpel that houses the ovule

Flowers that contain both stamen and pistil are called perfect flowers and are hermaphroditic (although many have developed strategies to prevent self-fertilizing). Flowers that are missing either stamen or pistils are called imperfect flowers and are unisexual flowers. Imperfect flowers that bear pistils only are considered female flowers, and those that bear stamens only are considered male. In species such as corn, male and female flowers are both found on the same plant, while in other species such as kiwifruit, a plant has only either male or female flowers.

Pollination is the transfer of pollen grains from an anther to a stigma, either within the same flower or between flowers of the same species. Once the pollen adheres to the stigma, it grows a tiny tube, all the way down the style to the ovary. The pollen tube carries the male gamete to meet the female gamete in the ovule, for a process called fertilization. The fertilized ovule goes on to form a seed and the ovary develops into a fruit to protect the seed.

In most cases pollen can't get from the anther to the stigma on its own, so plants rely on other things to move the pollen. In cases such as grasses and corn, wind is the vector that aids this process. However, three quarters of the world's flowering plants, and about thirty-five percent of the world's food crops depend on pollinators, such as insects, birds, and bats to reproduce.

It is believed that many plants have co-evolved with their pollinators, developing characteristics such as smell, color, and shapes that favour certain pollinators over others. Pollinators are

attracted to the flowers in search of food (nectar for energy and pollen for protein), and during their visit, pollen adheres to their body. When they visit a subsequent flower of the same species, the pollen rubs off onto the stigma, thereby pollinating that plant.

Bees (honeybees and solitary bee species) play a key role in the production of many food and forage crops across British Columbia including, alfalfa, apples, blueberries, cherries, cucumbers, kiwifruit, tomatoes, and pumpkins. The tree fruits in the Okanagan and berry crops in the Fraser Valley are very dependent on an abundance of bees when these crops are in bloom. Fruit growers rent large numbers of colonies from beekeepers. It has been estimated that honeybees are responsible for the production of \$160 million worth of crops in BC every year.

In recent decades, there has been much talk of population declines of pollinator insects, especially in agricultural areas. There are a number of reasons for the pollinator declines including agriculture activity, exposure to pollutants, habitat fragmentation, pests, and climate change.

An important factor affecting honey bee health is access to adequate nutrition. Without collecting enough good sources of nectar and pollen from flowers during the warmer months, honey bee colonies can face serious challenges during the winter. Large acreages of single crops (monocultures) means that much greater concentrations of pollinators are needed at bloom time, but the area can be forage poor or even deadly to bees for the rest of the season.

To counteract these trends, it's important that both public and private sectors contribute to bee-friendly habitats. Farmers can use bee-friendly cover crops and hedge rows along ditches and berms. Home gardeners and urban landscapers can include bee-friendly plants in residential and commercial landscapes. Teachers and students can plant bee-friendly flowers in their school gardens. Studies have shown that an abundance and diversity of nectar and pollen bearing plants can enhance pollinator populations, and that this in turn supports greater biodiversity and a healthier sustainable environment.

Materials

- Worksheets:
 - Have you Eaten...?
 - Postcard template
- List of some common crops pollinated by bees
- Video: *Which future do you choose?*
<https://www.youtube.com/watch?v=zhLDs3fgOMc>
- BCLNA Poster: Top Pollinator Picks for your Garden (available for order for free on the BCAITC website)
- 1/student BCLNA Postcard: Top Pollinator Pics for your Garden (available for order for free on the BCAITC website)
- Crafting supplies (crayons or felts, paper plates, string)

Extension Suggestions

- Flower dissection
- Observations: Which flower colors, or color combinations receive more bee visitors? Which less?
- Watch pollinators visiting individual flowers. How do they move on the flower? Why do you think they behave this way? Try adding a few drops of sugar or honey water to a few flowers. Do pollinators act differently on flowers with extra nectar as compared with natural flowers without supplemental nectar?
- Learn about how bees communicate where food sources are located

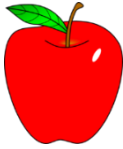






Procedure









1. Hook:
 - a. For younger students, have students read the names of the fruits and vegetables on the handout provided. In the third column titled "Have you eaten it" have students write either YES or NO. When they get to the end of the sheet, have them choose their favourite food from this list and write it in the space provided.
 - b. For older students, have them make a list of as many fruits and vegetables as they can think of. Read the provided list of fruits/vegetables that are pollinated by bees and have them put a check mark next to each one that they had on their list. Discuss the importance of pollinators to our food supply as a class.
2. Depending on the age level of your students, have them watch one of the following videos to help them understand how bees help plants:
 - a. Like Fruit? Thank a Bee <https://www.youtube.com/watch?v=txv2k7OoY7U>
 - b. Why do we need bees? <https://www.youtube.com/watch?v=6CxCTyxRFh0>
 - c. Bees help pollinate foods we need
https://www.youtube.com/watch?v=z3JU9P59_yY
 - d. Our Bee Song https://www.youtube.com/watch?v=oST_t2XaBaY
3. Class discussion:
 - a. What would happen if bees disappeared?
 - b. What types of things might make bees disappear?
 - c. Is there anything we can do to help the bees?
4. Have students watch the BC Landscape and Nursery Association video <https://www.youtube.com/watch?v=zhLDs3fqOMc>
5. Explain the BCLNA Top Pollinator Picks poster to the students and give each of them their own take home postcard version.
6. Activity:
 - a. For younger students: Create a bee mobile using a paper plate, string, and drawings of 6 of the flowers that they choose from the poster/postcard.
 - b. For older students: Design their own postcard with pictures of bee friendly plants on the front side and an explanation to their parents about why it's important to provide food for the bees on the backside

Have you eaten...

Name: _____

Date: _____


Food		Have you eaten it?
Apple		
Broccoli		
Watermelon		
Plum		
Pumpkin		
Lemon		
Kiwifruit		

Avocado		
Strawberry		
Cherry		
Cucumber		
Peach		
Blackberry		
Eggplant		
Blueberry		


My favourite food from this list is _____

Some Common Crops Pollinated by Bees

Alfalfa	Cranberries
Almonds	Cucumbers
Apples	Eggplants
Apricots	Grapes
Avocados	Grapefruit
Bell Peppers	Kiwifruit
Blackberries	Lemons
Blueberries	Limes
Broccoli	Mangos
Brussel Sprouts	Nectarines
Buckwheat	Oranges
Cabbage	Peaches
Canola	Pears
Cantaloupe/melons	Plums
Carrots	Pomegranates
Cherries	Potatoes
Clover	Pumpkins
Coriander	Raspberries
Cotton	Squash



A large rectangular box with a thick black border. A vertical line is positioned on the right side, approximately one-third of the way from the right edge. To the right of this vertical line, there are four horizontal lines stacked vertically. In the top right corner of the box, there is a smaller, empty rectangular box.



A large rectangular box with a thick black border, identical in layout to the one above. It features a vertical line on the right side, four horizontal lines to its right, and a small empty rectangular box in the top right corner.