



Decline of the Honey Bee Game

Developed in partnership with Joanne Nicklas of the Kamloops Beekeeping Club

Title: Decline of the Honey Bee Population (grades 4 - 8)

Overview: In this active lesson, students will learn about the decline of one of our well known pollinators - the honey bee. This is an activity that can be done indoors or out, the game pieces are included at the end of the lesson. Students will be transformed into worker honey bees and they will go about collecting pollen and nectar for their hive. Once the activity is over, the worker bees will classify their collection, and learn their hive's fate.

Learning Objectives:

Students will be able to:

- Understand several reasons why honey bee populations are declining due to predators or limiting factors, and the possible consequences.

	Curricular Competencies	Content
Science	<ul style="list-style-type: none">• Demonstrate curiosity about the natural world• Experience and interpret the local environment• Use tables, simple bar graphs, or other formats to represent data and show simple patterns and trends• Compare results with predictions, suggesting possible reasons for findings	<ul style="list-style-type: none">• biodiversity in the local environment (3)• sensing and responding: (4)<ul style="list-style-type: none">• humans• other animals• plants• organisms have evolved over time, survival needs, natural selection (7)
Math	<ul style="list-style-type: none">• Develop, demonstrate, and apply mathematical understanding through play, inquiry, and problem solving	<ul style="list-style-type: none">• one-to-one correspondence and many-to-one correspondence, using double bar graphs (5)
First People's Principles	"Learning ultimately supports the well-being of the self, the family, the community, the land, the spirits, and the ancestors." The skills learned in this unit will help students understand how many animals are connected, and ripple effects of one species impacting many others.	

Decline of the Honey Bee Game

Introduction to Honey Bees (15 min)

Materials:

Video access: [Busy Bees](https://www.youtube.com/watch?v=ta154f5Rp5Y) by SciShow Kids (<https://www.youtube.com/watch?v=ta154f5Rp5Y>)

1. **Introduce:** There's a lot of buzz in recent years about declining honey bee populations. From all species of bees to butterflies, ants to wasps, insect numbers are steadily declining. This is concerning for pollination and agriculture. We need these insects for pollination, and without pollination; we have less food available. Insect pollination is needed for about a third of the food we eat; so thank those pollinators who give you a variety of fruits and vegetables.
2. **Watch** [Busy Bees video](https://www.youtube.com/watch?v=ta154f5Rp5Y) to introduce bee behaviour and introduce pollination.
3. **Discuss pollination and pollinators:**
 - a. *What is pollination?* In order for fruit and seeds to form, pollen from the male stamens must be transferred to the sticky stigma portion of the female pistil. This is called pollination, and may occur by insects, birds, bats, wind or water.
 - b. *What are pollinators?* Bees (honey bees and native bees such as the orchard mason bee), butterflies, and other insects that pollinate flowers. For more information, see the [SPEC Guide p. 65](#).
 - c. *How do bees and other pollinators interact with flowers?* Many flowering plants depend on pollinators such as bees to incidentally transfer pollen to the pistil. However, the true goal of the pollinator in visiting a flower is to obtain food in the form of nectar and pollen.
 - d. *What are some foods that are pollinated?* All fruits and most vegetables are pollinated; basically anything that came from a flower! Pollinators are an important part of our ecosystem.
 - e. *Why are honey bees in danger?* Honey bees are experiencing many dangers including habitat loss (loss of flowers and sources of food), predators, limiting factors such as chemicals, and weather. Honey bees need a variety of plants to maintain themselves and to preserve a healthy colony.

For more information and links, see the Extension Activities below.

Decline of the Honey Bee Population Game (25 min)**Materials:**

- Print the Activity Cards page, 1 page per student, and cut out the cards.
- Print the Answer Key to share the explanations during step 7.
- Print one graph for each student.
- Each student will bring out a “hive” to play the game, which is where they will pile all of their food cards. Consider something so the cards will not blow away if outside (this could be a hat, sweater, folder, etc.)

Before the lesson: distribute the cards over a field or playing area, and if necessary, mark boundaries to indicate playing area.

1. Bring class outside, ensuring each has a hive to collect their cards in.
2. **Introduce bee types (outside):** There are three kinds (castes) of bees: workers (females), drones (males), and a single queen in each hive. There are several roles the worker bee has including housekeeper, nurse, guard, and forager bee. For this activity, you are all forager worker bees now! You will be collecting pollen and nectar food cards, and bringing them back to your hive.
3. **Introduce the game rules:**
 - a. Bring all of the cards you collect back to your “hive”.
 - b. Collect only one card at a time.
4. Give the class about 5 minutes to collect pollen and nectar for their hive, or enough time for most/all of the tokens to be collected. (Get someone to collect all the left overs, so they don't litter)
5. Bring the class back inside.
6. Students then classify their food tokens, organizing them into each type. Count the cards, and record in the count row on the bottom of the graph.
7. Students then learn that some of their tokens will lead to death of the bee and/or hive. Using the Answer Key below, read the descriptions of each scenario. After you read each description, have students complete that column of their bar graph.
8. After the students have their bar graphs completed, read out each scenario to determine the fate of their hives:
 - ✓ If you have 6 or more *Dandelion* cards (indicating healthy food), your hive will survive, regardless of what other cards you have.
 - ✗ If you have 2 or more *Herbicide Poisoning* cards, your hive will suffer a slow death as many forager bees will bring the poisonous pesticide back to the hive on their feet, and it will be spread throughout the hive.
 - ? If you have 2 or more *Monoculture* cards, you are now a weaker hive as your variety of food is limited once your main food source has finished flowering.



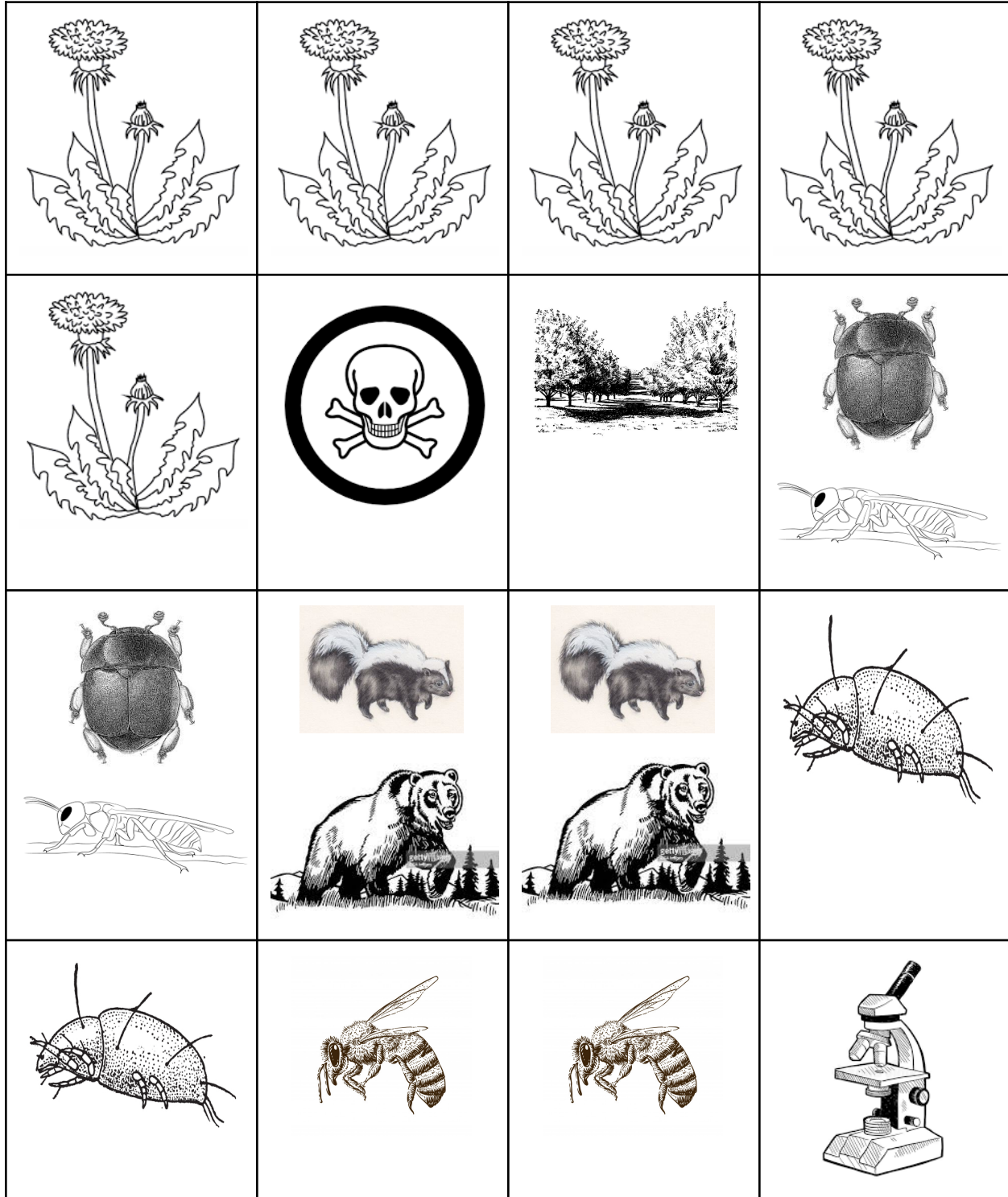
- ✕ If you have 2 or more *Asian Giant Hornet* cards, your hive has been attacked by these predators and all the bees have died.
 - ✕ If you have 2 or more *Bear* cards, your electric fence is not working, and the bear has eaten your bees, brood and honey in the hives.
 - ✕ If you have 3 or more *Dead Bee* cards, that means your hive has died in the winter due to either starvation or excess moisture.
 - ? If you have 3 or more *Mite* cards, you have a weak hive and you must treat your hives immediately in order to not have all the bees die.
 - ✕ If you have 3 or more *Disease* cards, your bees will start the winter appearing healthy, but then they will all die as they are in a weakened state.
9. As a class, students will discuss the fate of their hive, and learn about their classmates' hives. In this way, students will become more familiar with predators and limiting factors and the effect on honey bee populations. Write an explanation of why their hive died at the bottom of their worksheet.
10. *Extensions:* Students could also post their results as fractions and decimals. Students may represent their learning by showing what class percentage of the hives (students) are going to survive as strong and healthy hives (6 or more dandelion cards), how many are weak hives, and how many hives are not going to survive, and why.

Key Vocabulary

Worker Bee, Queen, Drone, Hive, Cell, predator, limiting factor, pollen, nectar, herbicide, monoculture, predators, disease, brood




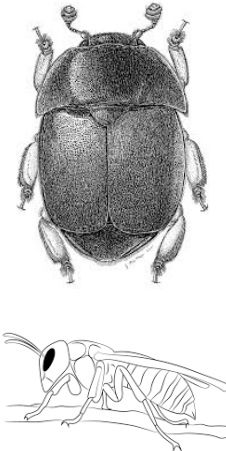
Research could be done pre or post activity on the pollen/nectar cards.



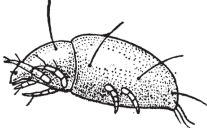

Decline of the Honey Bee Game Activity Cards

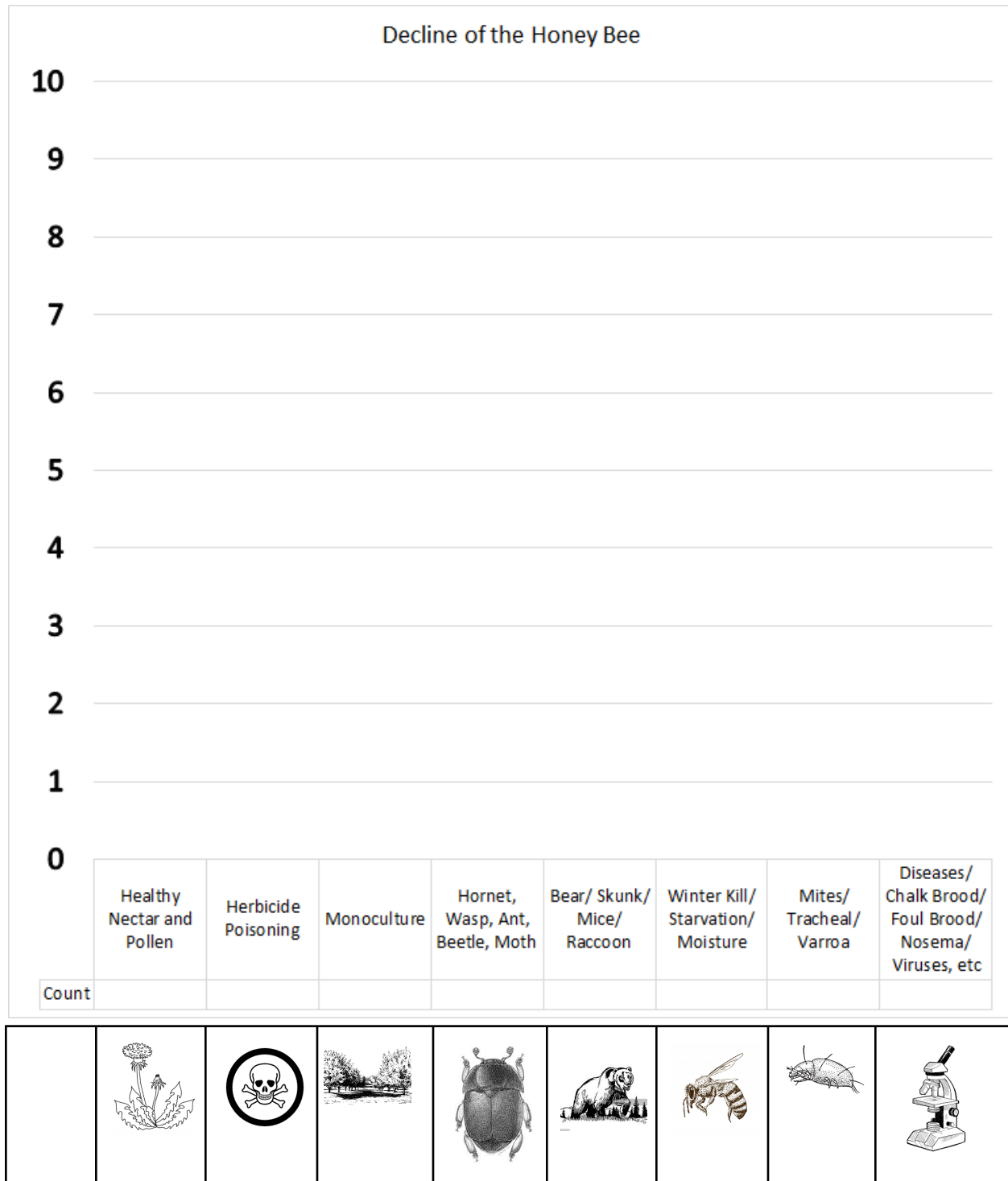


Decline of the Honey Bee Game Key

What do the pollen and nectar cards mean for the honey bee?

Icon	Meaning	Description
	Healthy Nectar and pollen	Many worker bees are foragers and collect pollen and nectar from flowering plants (while pollinating the plant), and return this food to their hive where “honey bees” make this into food for their hive members and store extra as honey. A constant supply of different flowers is the best for a growing, healthy hive.
	Herbicide Poisoning	Unfortunately, a landowner has decided to spray a patch of weeds (unwanted plants), with a poisonous herbicide to kill the plant. The flowers of this unwanted plant appear attractive to foraging bees, and the bees land on this plant and then get the herbicide on their feet, and take this poison back to their hive.
	Monoculture	In some areas, there are huge fields of the same plant and few other plants growing. Almond trees, corn fields, and orchards with one type of plant are examples. Once this plant has finished flowering, there is little food for the honey bees.
	Giant Asian Hornet, Wasp, Ant, Hive Beetle, Wax moth	These insects are all predators to honey bees, and they can weaken or kill the hive. Giant Asian Hornets have been spotted in BC and will attack and kill a complete hive quickly. Wasps and Hornets are usually troublesome in the Fall, and they will find a weaker hive, attack it until the honey bees are killed, and then rob everything in the hive. The Small Hive Beetle larvae feed on honey, pollen, and brood. The larva defecate on the honey causing it to ferment, and leaving a slime that needs to be cleaned out before the hives can be used. The Wax Moth larvae hatch in the comb and form feeding tunnels that are lined with layers of silklike fibres that form a dense insulative webbing making removal of the larvae difficult by worker bees.

	<p>Bear, Skunk, Mice, Racoons</p>	<p>These animals are all predators to honey bee hives and they can kill, damage, or destroy the hive. Mice feed on pollen, honey and dead bees and may destroy large numbers of frames and comb. Racoons will prey on honey bee larvae and honey, and an adult racoon can push over a small hive. Skunks often scratch at hive entrances and eat the bees that come out to investigate. Bears can destroy a complete bee yard as they topple the hives to get at the brood and honey. Hives and frames are often unrepairable, and often few bees can be saved.</p>
	<p>Winter Kill - Starvation or Moisture</p>	<p>Honey bees need a large amount of honey left in their hives in the fall in order to have food and survive the entire winter until they can get out and forage for early flowers in the spring. If the hives do not have good ventilation, moisture can build up and kill the bees.</p>
	<p>Mites - Tracheal and Varroa</p>	<p>Beekeepers usually have to treat for mites or the mites, a parasite, will weaken the hive; often causing the hive to die. Mites can feed and live on adult honey bees, but they mainly feed and reproduce on larvae and pupae as they develop, causing malformation and weakening, as well as transmitting numerous viruses. There are different treatments available to put in the hive to kill the mites, but not harm the bees. Mites are a very common problem for beekeepers to deal with.</p>
	<p>Diseases - chalkbrood, foulbrood, nosema, viruses, etc.</p>	<p>Protecting honey bee hives from bacterial, fungal, viral, and protozoan diseases is a component of beekeeping management. Beekeepers need a basic understanding of disease identification, prevention, and control procedures.</p>





Did you survive? Why or why not?

Write as though you are a worker bee: What is your job, and what challenges might you face?

What could you tell people to do to help you and all honey bees to have a better survival rate?

How does your fate after playing this game compare to one or two other classmates?

Extension Activities

The following extension activities could be done before or after the game to enrich learning about honey bees. Extensions include independent research activities and whole class lessons.

1. Let's meet a beekeeper!

Get in touch with the Kamloops Beekeepers Club and invite a beekeeper to talk to your class. [Contact link through website](#). After a request is made, The Kamloops Beekeepers Club will survey their members to have a Beekeeper either visit or zoom with a classroom wanting to learn more about Honey Bees.

Students can ask any questions they have, and teachers can ask for the beekeeper to focus on specific topics (life cycle, castes and roles, how pollination happens, how honey is made, parts of a hive, what a beekeepers job entails, to other topics that connect with learning outcomes specific to grade level.) Teachers; please elaborate on what you would like the beekeeper to focus on for your grade level.

2. What is the life cycle of a honey bee, and what are the castes and roles of honey bees that make up a hive?

1. Review the life cycle of the honey bee
 - [Honeybee](#)
 - [Honey Bee Life Cycle](#)
2. Review the 3 castes in a honey bee hive, and role of the worker bee.
 - [Honey Bee Jobs](#)
 - [Beekeeping](#)
 - [The Type of Bee](#)

3. How do honey bees pollinate flowers, and bring pollen and nectar back to their hive?

1. Students could begin to understand the parts of a flower that honey bees and other pollinators pollinate; and how small grains of pollen and nectar are collected from the flower.
2. Students could begin to understand that small grains of pollen are transported back to the hive (in pollen baskets on their back legs), and how nectar is sucked up by their proboscis and put in the honey stomach while it is transported back to the hive. Then this nectar is passed on (mouth to mouth) to other "honey making bees", where moisture is removed until it is honey that will be stored and capped in cells. The pollen grains are passed on to other worker bees at the given time.
3. Students will begin to understand that honey bees have color preferences when visiting flowers.

- [Life cycle of a flowering plant.](#)
- [Honey Bee Centre: Pollination](#)
- [Importance of Bees: Pollination](#)
- [How Bees Make Honey](#)
- [Harvesting Honey](#)
- [Bee Vision vs Human Vision](#)
- [SPEC Guide p. 65](#)

4. What are threats to bees?

Students could begin to understand that limiting factors and predators affect hive health and numbers. For this activity, limiting factors are: herbicide poisoning, monoculture, starvation, and winter moisture. Predators are: Skunks, mice, bears, mites, diseases, wasps, hornets, and hive beetles. There are also other bacterial, fungal and viral diseases that can affect bees, but for this activity, predators and limiting factors that students can connect to easily are focused on.

- [Pollinator Decline](#)
- [Colony Collapse Disorder](#)

5. How can we help Honey Bees and other pollinators?

Students will begin to understand that we can do things to help honey bees and other pollinators.

- [6 Ways to Help Honey Bees](#)
- [Gardening for Pollinators](#)

6. Tell a Story from the Perspective of a Bee (ELA)

Students could write a honey bee life story with information they have learned about honey bees: "My Life Story - The Life of a Honey Bee"

7. Indigenous Perspective/Native Plants (Science)

Students will begin to understand that pollination is required for many of the plants that were collected for food, and research ways to preserve that food. Research the idea of interconnectedness, and traditional Secwepemc plants that depend on pollination (e.g. saskatoon berries, oregon grapes, and wild roses).

8. Cooking with Honey and Your Health (PHE)

1. Students will begin to understand that honey can be substituted for many recipes that call for sugar. Honey is also popular for canning and making jams and spreads. Have the students research recipes where these substitutions can be made.
2. Research what exactly honey is, and what nutrients are in it.