

Lesson #1: Plants, Planet, People

Our Connection to Plants

01

Big Idea



The health of people and the health of our planet depends on plants! As humans, we rely on plants in many ways - for food, shelter, clothing and even the air we breathe. The health of our planet relies on plants too. Students will explore the interdependence of plants, animals, and the important roles plants have for all to live on Earth.



Suggested Steps:

1. Start by watching the video, pausing at Stop & Checks. Alternatively, begin with the first activity and then watch the video.
2. Complete the second activity (prepare the boreal forest cards first)
3. Close the lesson with a journal reflection prompt or My Climate Story hand-out.

Guiding Questions:

- What are some ways that we use plants in our daily lives?
- In what ways do living things depend on plants to survive?
- How do plants depend on us?

Learning Objectives

I know (knowledge), I can (skills), I understand (conceptual understanding)



I KNOW

- ↳ That plants play important roles on Earth that are essential for all life on earth
- ↳ The role of plants in food chains and webs.



I CAN

- ↳ Identify how I use plants in my daily life.
- ↳ Explain the roles that plants play in creating a healthy world for all life.



I UNDERSTAND

- ↳ How different plants and animals depend on each other.
- ↳ My responsibility to help plants and plant habitats live and thrive.



Lesson #1: Plants, Planet, People

Activity 1: Plants Around Us

Time: 20 mins

Process: 9 steps



Materials Needed:

- “Plants Around Me” Handout
- “Classroom and Home Illustrations” for brainstorming (optional)
- “My Plant Connections” student handout (optional)
- Pencil & paper
- Flipchart or whiteboard & markers

Discussion

1. Ask your students a few guiding questions from above, such as “What are some ways that we use plants?” and “What objects around us are made of plants?”
2. Ask students to look around the room. Alternatively show the “Plants Around Us” posters for additional examples.
3. What plants do you see - either living plants or pictures of plants in the room? You may choose to write a list of sight words for vocabulary.
4. Look around again. What products do you see that are made out of plants? It may be easiest to start with items made out of wood. What about plant products that are in your desk or your lunchbox?

“Plants Around Us” classroom poster



Examples of Plant Products Around Us

- Rubber in sneakers from rubber tree
- Jeans (cotton), or linen or hemp clothes
- Books, pencils, posters (trees)
- Desks (trees)
- Food in lunch
- Ink (most is vegetable-based)
- Hand-soap or fragrances (palm oil)

Activity

5. Working together, think back to how you started your day, and consider whether you interacted with any plants or plant products. For example create a list of plants you have used or seen since you got up this morning. You may want to use the “Plants Around Me” template in the Appendix.
6. Use the five senses to help you in your brainstorming. What plants did you see, hear, smell, taste, touch? When you got out of bed? At breakfast? On your way to school?
7. Now ask students to think about the rest of the day. What future plant interactions will they have? What about during meals like lunch or supper? How about outside or during other play?
8. Optional: Have your students break out into small groups and complete the “My Plant Connections” worksheet, and come back to the whole group after.
9. Gather student suggestions and check for understanding. What new plants did we learn about in this activity? Are we surprised about how many plants we rely on?

Accommodations or Extensions

- ↳ You may want to do this activity by having students interview each other in partners. Encourage the listening partner to ask questions to help fill in the “Plants Around Me” template.
- ↳ You may want your students to take home the “My Plant Connections” worksheet (or an extra copy) to explore with their family the different plant or plant products they interact with, and bring it back to class the next day.

Lesson #1: Plants, Planet, People

Activity 2: Relationship Webs

Time: 25 mins

Process: 16 steps

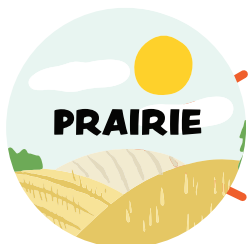
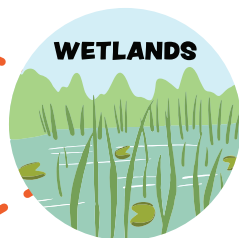


Materials Needed:

- Paper cut in half or quarters (1 per student)
- Pen or pencil
- Markers/pencil crayons/crayons
- Long ball of yarn or string
- “Boreal Forest Flash Cards” (optional) to facilitate activity

Discussion

1. Ask your students to think about what a habitat is. How would you describe it? Habitats are the place where a living thing has shelter, food, and water.
2. What is the name of our habitat?
3. Can you think of an animal or plant and name its habitat? Ask your students to think of an animal and the habitat it would live in.
4. Now think about the different animals, plants and organisms and every other living thing in a particular habitat. Can we name what else might live there? How about a pond? A desert? Or a tree outside the school? What about a garden?



Activity

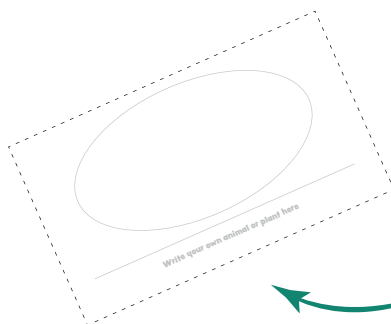
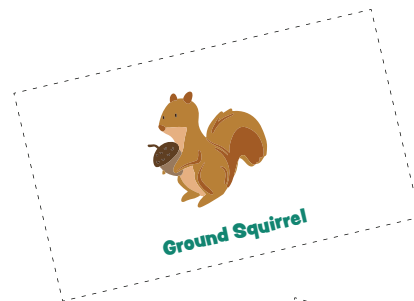
5. You might want to do this activity outside for more space, though inside is fine too!
6. In this activity, you will be looking at how different species are connected within a larger habitat (home) or an ecosystem (a ‘neighbourhood’ of habitats)
7. Determine a specific habitat or ecosystem with your students that you will use for this activity, like a forest, a field, or a farm! If you’d like this ready to go in advance, print out the “Boreal Forest Flashcards” and focus on the boreal forest as the example.
8. Ask your students to list all of the important living things they can think of in that setting. To help in the brainstorm, think about plants, animals, and other species. Then, think about the tiniest animals and plants, medium-sized ones, and the largest. If you want, you can add in non-living things too!
9. Jot down the long list of answers students give you. When you have as many examples as there are students in the class, stop.
10. Hand out papers and assign each student a species to draw on that paper, either randomly from your jot notes, or let them choose. You may want them to write the word too! Or, use the “Boreal Forest Flashcards.”

Activity 2: Relationship Webs

11. Have students stand in a circle and hold out their piece of paper for all to see.
12. You will start this activity with your own paper, depicting the sun. You might want your students to guess what you've drawn by giving the clue *"I am a non-living thing that is essential for plants..."*
13. You'll start with the ball of string. Tell students that they have to pass the string to another species and answer the question: *"Who am I connected to?"* To start, look for a plant, throwing the ball of string to that student and answering the question, reminding students about the role of photosynthesis.
14. Ask that student to then make a connection to another species. As a prompt, ask students about needs such as shelter or food, or food for another species.
15. Let students know that they can go back to another species (or the sun!) but encourage everyone to connect with someone who hasn't gotten the string yet first.
16. Once everyone has gone through, look at the web. Ask students to think about the connections that happened. Did any surprise you?

Accommodations or Extensions

- ↳ To modify the string toss activity, try challenging your class to imagine different environments across Canada, helping them to explore different plants and animals.
- ↳ You may want to challenge your students to think about humans. How many of the cards would be connected directly to a human? (For example, a human picking berries or mushrooms, or hunting a moose for meat and clothing?)



Create your own too!



Lesson #1: Plants, Planet, People

Digging Deeper



My Climate Story Reflection

As part of planting seeds for climate stories, your students are developing their own story to help them walk through their role in climate change. You can use this assignment in place of -or to support- a journal reflection.

The companion worksheet for developing My Climate Story for this lesson asks your students to describe and draw things in their lives (people, places, priorities), that matter most to them.

For further support to help your students develop their own Climate Story, check out the explanation in the Teacher's Guide.

Reflection/Journal Prompts

- Imagine a world without plants. What would you have to do without? Would we survive?
- What are different ways we can show respect towards the Earth and plant life?
- What are some different ways that you use plants in your everyday life?

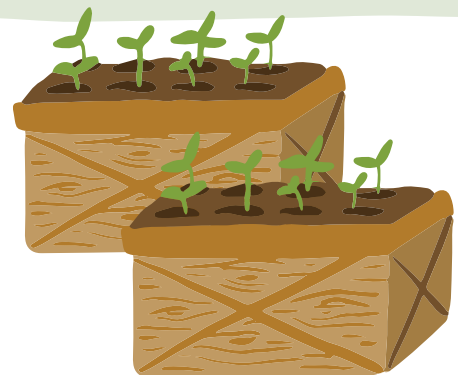


Assessment/Evaluation

The graphic organizer exploring interactions from the first activity can act as a great exit slip. Check for student understanding using the class discussions from both activities, as well as the journal reflection. Use My Climate Story assignment for personal connection to the topics.

Diving Deeper:

- ↳ Vermicomposting is a fun way to explore the intricate system of plants with soil via the breakdown of nutrients by worms. Try it in your class and help your students better understand the relationship of plant health to soil health, and the biodiversity that ensures all creatures survive in this ecosystem.
- ↳ Connect back your exploration of biodiversity webs by using a local garden as another example. Have students practice inquiry on what living and nonliving things are required for a successful garden. Which things depend on other things? How many connections can be made?



Lesson #1: Movie Moment!

Plants, Planet, People (Length: XX minutes)

Watch the video at: <link>



This video explores the important roles that plants play for life on Earth to exist. **<bold>** It explores how humans and animals rely on plants, which support their own habitats - providing food, shelter and everyday materials we can find right in our own homes.

Plants also have essential functions in natural ecosystems too - including regulating oxygen and carbon dioxide in the atmosphere through photosynthesis, preventing erosion and helping cool the planet through transpiration (releasing water). A brief overview of photosynthesis is explored, as well as foodchains and food webs.

The video concludes with a reminder about the impact natural habitats can have for the earth, through destruction and pollution. Students are reminded of the importance of plants for the health of ourselves and our planet, and not to take their presence for granted. Individual actions students can take to help plants thrive are shown.



Stop & Check!

Pause the video at this timestamp to check for your students' understanding.

- How do plants produce oxygen? [02:26]
- What are the ways that you can protect the plants around you? [05:22]

Sight Words to look out for:

- | | | |
|------------|------------------|----------------|
| • Habitats | • Boreal Forest | • Oxygen |
| • Shelter | • Amazon | • Food Chain |
| • Erosion | Rainforest | • Food Web |
| • Organism | • Photosynthesis | • Relationship |
| | • Carbon Dioxide | |

Did you know?

Plants aren't the only organisms that rely on photosynthesis - some bacteria and algae photosynthesis as well!

Explore this concept further using the Little Green Thumbs Carbon Cycle Poster, found online.



Teacher Background

Expand Your Worldview

01

A **Food Chain** demonstrates who eats whom in the wild. All living things - from plants to grizzly bears—need food to survive. A food chain is a linear pathway which demonstrates how energy and nutrients can flow through the ecosystem. Plants are primary producers, and the start of almost all food chains.

Food webs provide a larger, interconnected picture of the relationships and interdependence of several living things that provide food for other living things in the while. A Food Web is a non-linear representation of how energy and nutrients can flow through an ecosystem.

Everything is connected within an ecosystem, even though the roles and needs of particular animals or plants may be unseen. Because of this **interdependence**, one change can have a big influence on the species around it.

Indigenous Connections:

Interdependence between living and non-living species has been a foundation for many Indigenous worldviews in Canada. To help youth better understand these connections, look to a local author, storyteller, or Elder who might be able to provide a local context.

Exploring different representations of the circle of life can also help make these connections clearer for your students. One well-known example of this is the Medicine Wheel, a sacred rock monument important to many First Nations communities. The wheel outlines the four directions and the circle of life. ***Note that medicine wheels are not used by all First Nations communities, and their teachings should not be appropriated. Consult with your local community to see if they are in use, and do not build your own.*

Check out the *Teacher Guide* for more inspiration and information.

Science Review

You may choose to explore the following concepts further with students.

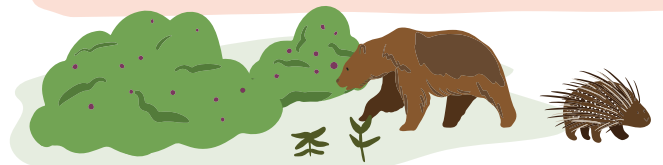
Photosynthesis is the process by which green plants use sunlight to create energy, using carbon dioxide and water. When a plant photosynthesises, oxygen is released as a byproduct of this process. Humans and animals breathe oxygen and release carbon dioxide into the air. Plants have an essential role providing the oxygen we breathe.

You would need a large greenhouse of plants to see a significant difference in oxygen in a space. However, when we refer to the Amazon rainforest as the lungs of the planet, we're not joking!

Speaking of the Amazon, the video features our hemisphere's equivalent: the **boreal forest**. This type of forest stretches across Canada and the rest of the Northern Hemisphere.

Did you know?

Canada has 30% of the world's forest, so keeping this national treasure, the boreal forest, healthy keeps the rest of the planet in good health too.



Activity 1: Plants Around Us

Graphic Organizer for *My Plants Connections*

01

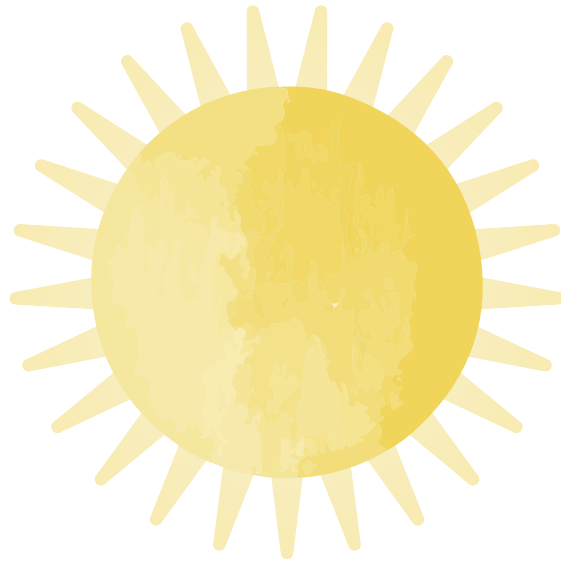
TIME OF DAY	ACTIVITY	ITEM	PLANT SOURCE
7:00 am	Waking Up	Sheets	Cotton



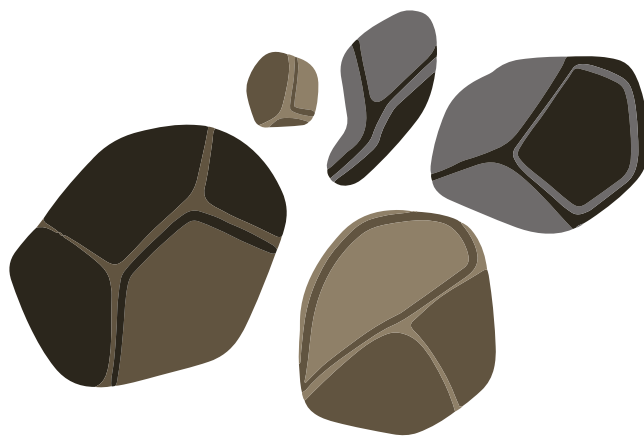
Activity 2: Boreal Forest Flashcards

Use the following flashcards to help develop relationship webs in the boreal forest. How many connections can you make?

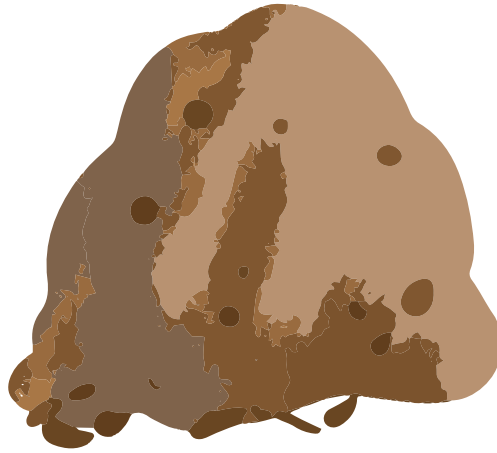
01



Sun



Rocks



Soil



Lichen



Moss



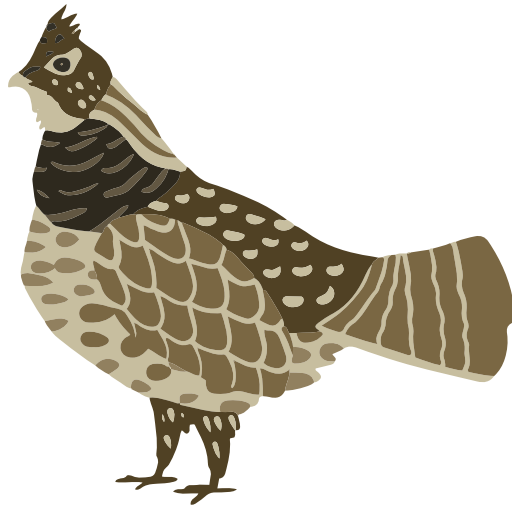
Ferns



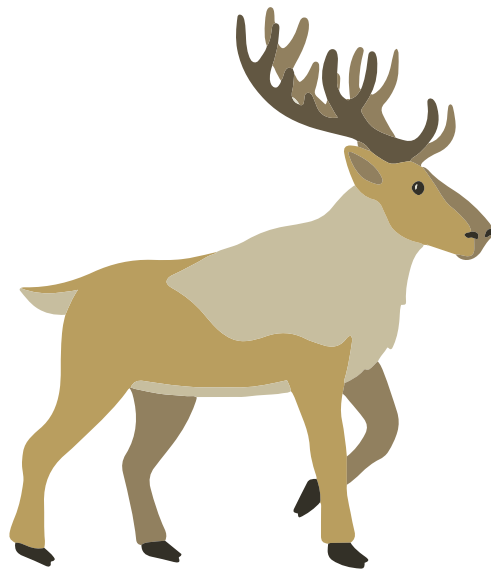
Mushroom



White Birch



Grouse



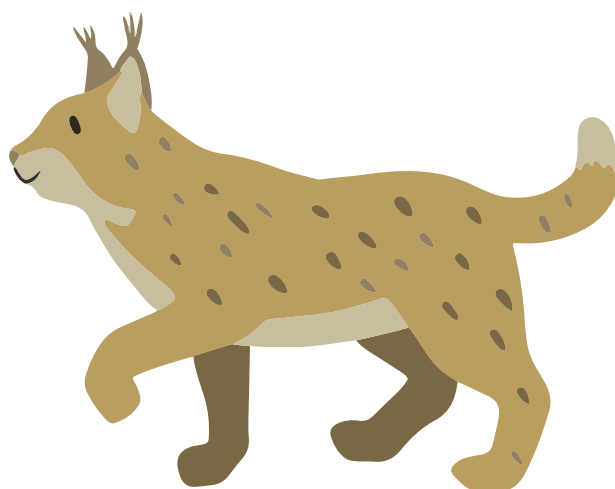
Caribou



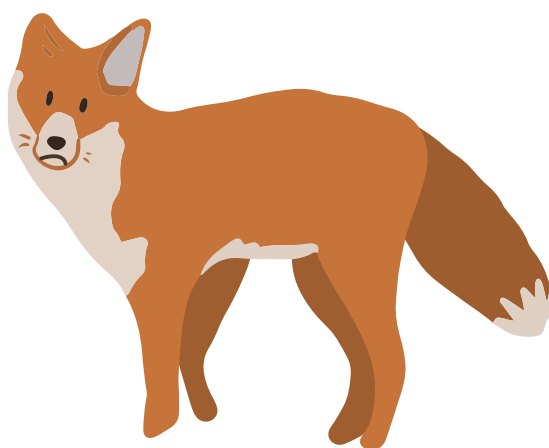
Ground Squirrel



Great Horned Owl



Lynx



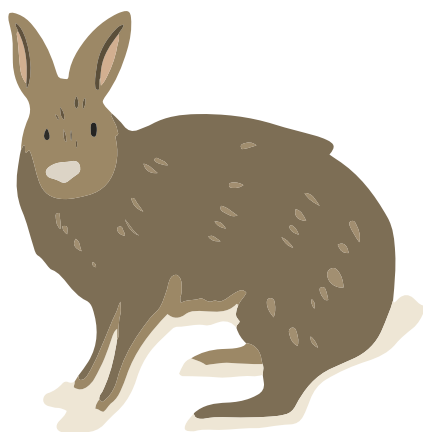
Red Fox



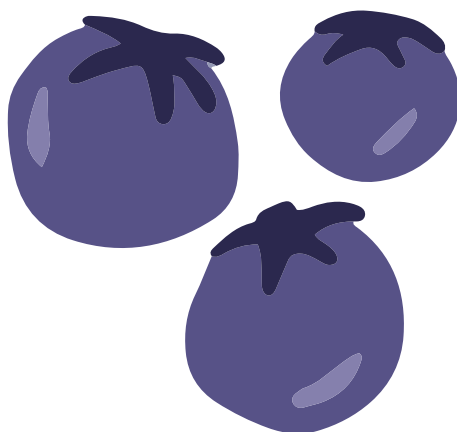
Coyote



Red Squirrel



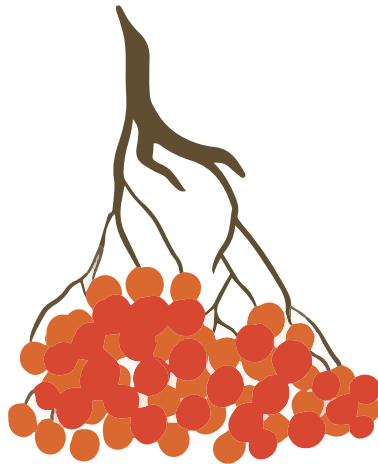
Snowshoe Hare



Blueberries



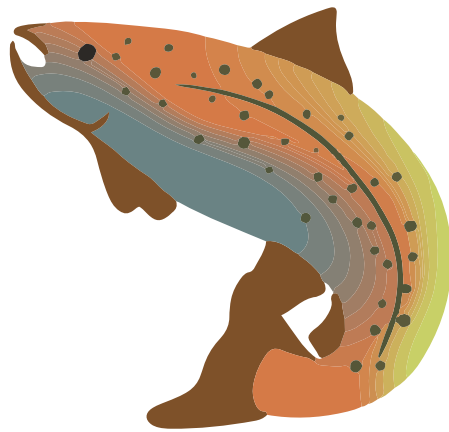
Willow



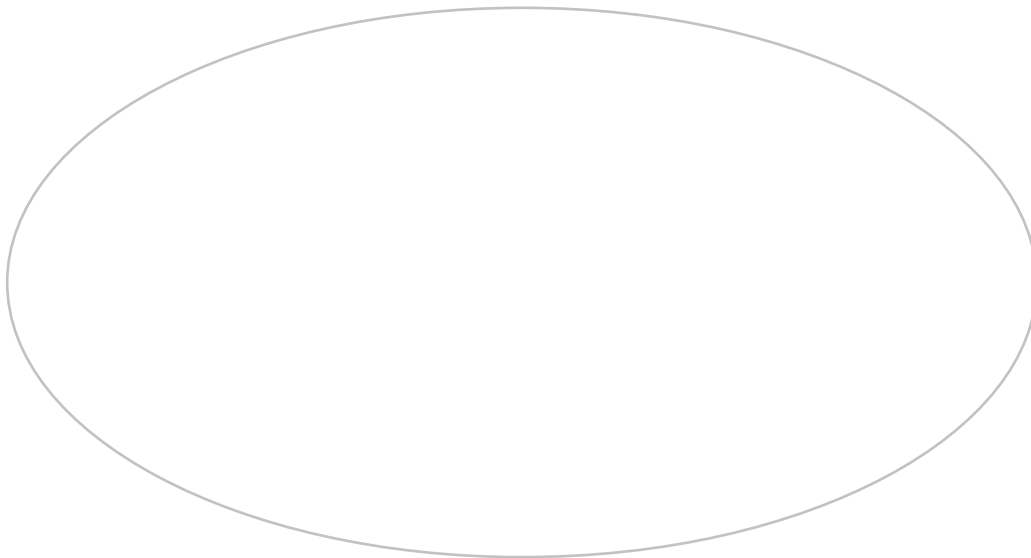
Mountain Ash (snow berries)



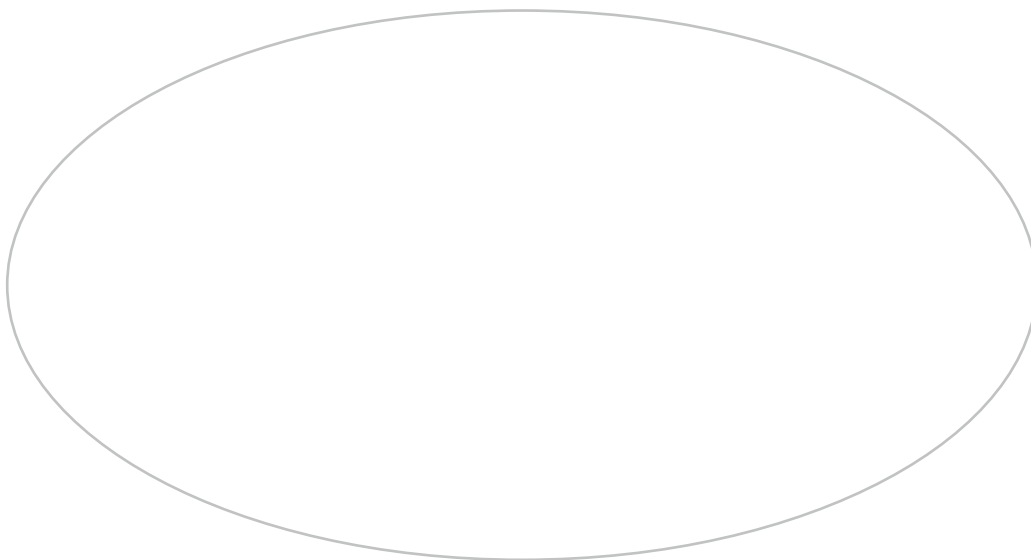
Beaver



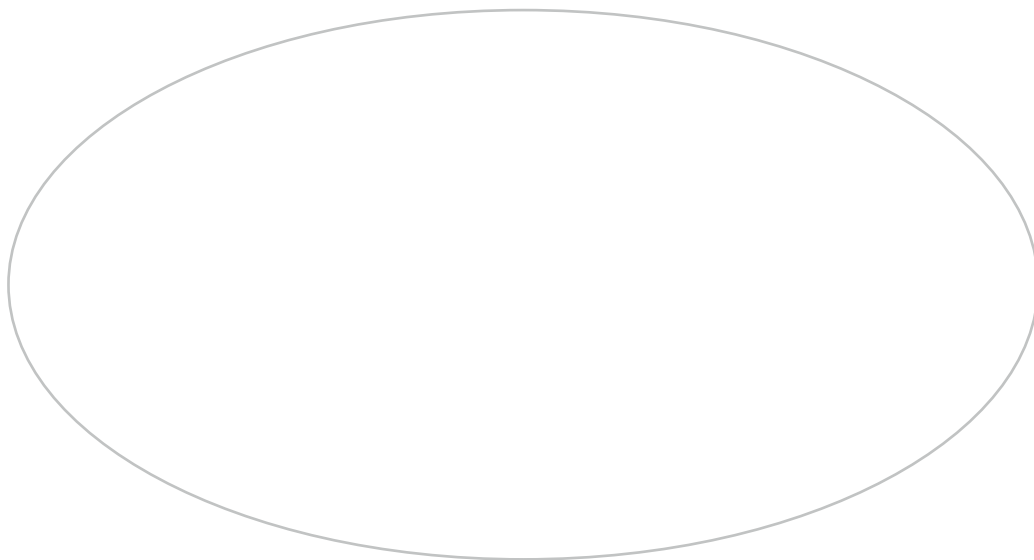
Brook Trout



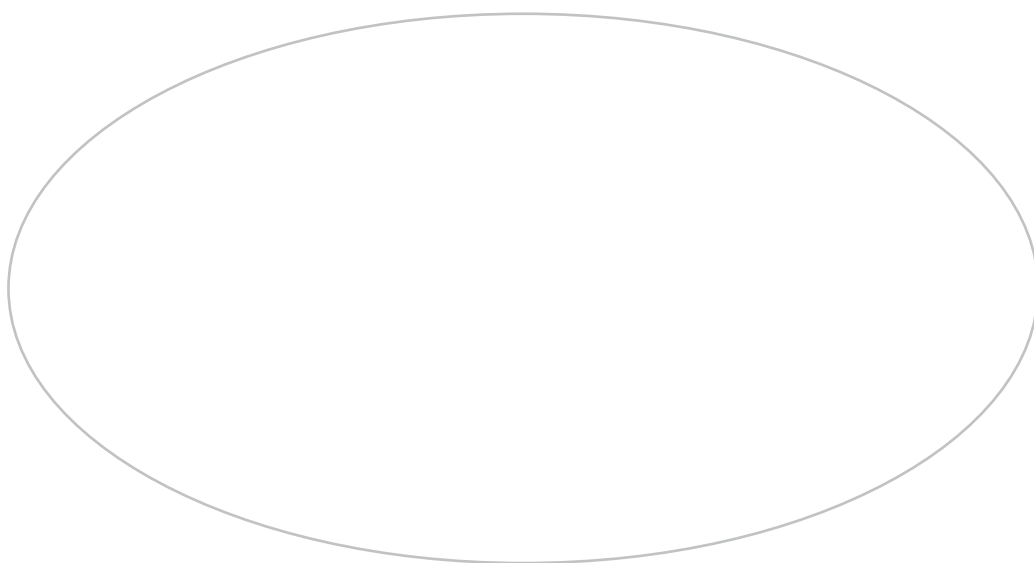
Write your own animal or plant here



Write your own animal or plant here



Write your own animal or plant here



Write your own animal or plant here

Lesson #2: We All Have Needs!

Using LAWNS to Explain Plant Needs

Big Idea



Just like humans and animals, plants have needs that must be met for them to stay healthy and grow. In this lesson, we'll explore 5 important plant needs using the acronym **LAWNS**, which stands for (L)ight, (A)ir temperature and movement, (W)ater, (N)utrients, and (S)pace to grow, such as in the soil.



Suggested Steps:

1. We recommend starting with the first activity to chart plant and human needs.
2. Afterwards, watch the video and review your diagram to see if anything new was discovered.
3. Finally, if time allows, try out Activity 2.
4. Close the lesson with a journal reflection prompt or My Climate Story handout.

Guiding Questions:

- What do plants need to grow?
- What needs do we have in common with plants?
- How can we help a plant to meet its needs?

Learning Objectives

I know (knowledge), I can (skills), I understand (conceptual understanding)



I KNOW

- Most plants have the same basic five needs (represented by **LAWNS**).
- Plant needs vary depending on the plant.



I CAN

- Compare and contrast the needs of plants to the needs of other living things, like humans.
- Identify when needs of plants are not being met and how I can help them.



I UNDERSTAND

- How the needs of plants can differ based on habitat or ecosystem.
- My role in supporting plant needs when they are not met by nature.

Lesson #2: We All Have Needs!

Activity 1: Plant Needs & Human Needs

Time: 20 mins

Process: 10 steps



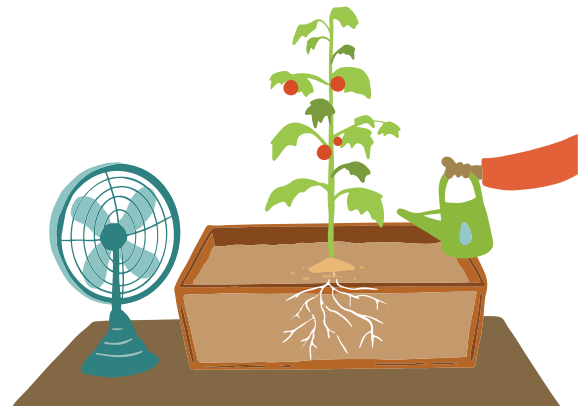
Materials Needed:

- Flip Chart paper or whiteboard and markers

- “Plant & Human Needs Venn Diagram” student hand-out.

1. Draw out your graphic organizer, either a two column chart and a Venn Diagram, or just a Venn Diagram.
2. Note: It might be easier to start with two columns -plant and human needs- and turn this into a Venn Diagram after.
3. Ask the class to think about what they need to survive. Jot down their answers. You may want the students to discuss in partners and report back, or do this all together.
4. You may want some questions to help the conversation.
 - a. What is the difference between a need and a want?
 - b. Do I need video games to survive? Dessert? Can we put that suggestion into a larger category or group of things to discover the larger need?
 - c. For me to stay alive and healthy, what do I need?
5. After you have your human needs column completed, move on to plants.
6. Now ask the same question about plants. To help prompt your students, have them think about what makes plants healthy, and what makes them look sick. What might that plant need to feel better?
7. Populate the plant needs column or circle as appropriate. Determine together what are shared needs that can go in the middle.
8. After you’ve run out of suggestions, review the Venn Diagram again. You may want students to follow along and copy the words together, or do this activity in pairs.

9. As a closing activity, write down the acronym **LAWNS** on the board. Tell your students that each letter is the start of a word of something a plant needs. Can they guess what each word might be?
10. Leave space to write down their different ideas of the words, and revisit after watching the video on **LAWNS**.



Accommodations or Extensions

- ↳ With older students, consider connecting to Maslow’s hierarchy of needs. Ask the class to brainstorm more complex and simpler needs humans have. Then, reveal the hierarchy to help discuss the different needs of humans vs. plants, but the important role plants play in helping us meet our basic needs for survival.

Lesson #2: We All Have Needs!

Activity 2: Plant Doctor (Using LAWNS)

Time: 30 mins

Process: 12 steps



Materials Needed:

- At least 5-7 plants to study (either indoors or outdoors)
- “Plant Health Chart” student checklist handout (1 per student)
- Pencil and eraser
- Doctor’s costumes or white painting smocks (Optional)

1. The location of your plants will determine whether to do this activity inside or outside.
2. Explain to your students that today they will be looking at plants to see how healthy they are. They will be playing the role of plant doctors.
3. Brainstorm together how doctors act with their patients. What is their role in society? How can we be caring plant doctors?
4. Remind students to be gentle when touching or moving the plants: you don’t want to startle your patient or bend them or break off any of their appendages.
5. Choose your first plant patient to inspect together and ask students some prompts along the way using the checklist to help the diagnosis.
6. Light: Check the leaves for healthy and consistent colour. Are any leaves shrivelled up, dry, or cracking? Are they spotty?
7. Air: Check the temperature of the air around the plant. Is it too close or far away from heat? Do you think it might be getting too much or too little? Moisten your thumb and stick it in the air next to the plant. Any wind or air circulation? Too much?
8. Water: Is the soil in the pot moist? Or too dry?

9. Nutrients: while hard to tell, check the leaves again and the stem. Does it seem healthy? Are there any pests, interesting spots, bugs, etc.? Is there anything around it -like fertilizer- that we could look at to see what nutrient supports it is getting?
10. Space: How confined does the plant look? How would you compare the plant to its pot size? Are there other plants close to it?
11. After you’ve done your first inspection of one plant as a class, divide the students up in small groups to assess another plant.
12. Report back once all of the groups have had a chance to do a similar inspection.



Accommodations or Extensions

- ↳ As you go through different plants diagnosing their condition, you may find mostly healthy plants. Your students can take this activity a step further by switching to the role of plant scientist. Assign students in groups to have an experiment plant by changing one condition - for example, giving the plant less light) for a few days. You may want to have a control plant that you compare with the rest of them to see how they are affected.

Lesson #2: We All Have Needs!

My Climate Story Reflection



As part of planting seeds for climate stories, your students are developing their own story to help them understand their role in a world facing climate change. You can use this assignment in place of -or to support- a journal reflection.

The companion worksheet for developing My Climate Story for this lesson asks your students about the needs they require to thrive in their habitat. We have more complicated needs than plants, including time with other people, love, joy from leisure activities, and a sense of community. Reflecting on these different needs is important when we find ourselves exploring difficult topics. We can always remember we have each other and different supports that keep us happy.

For further guidelines on helping your students develop their own Climate Story, check out the explanation in the Teacher's Guide (page #).

Reflection/Journal Prompts

- Write a prescription for a plant, real or imaginary. What would its particular needs be?
- What need do you think is most important for a plant?
- What advice would you give someone growing a plant for the first time?



Assessment/Evaluation

Formative evaluation can be done through noting student suggestions and participation in both activities. Both worksheets can assist with summative evaluation, as well as the journal or reflection questions.

Extension Activities:

- ↳ Explore your local ecosystem with your students and examine how the needs of local plants are provided with support by humans, or naturally. How do humans intervene to provide plants with the things they need?
- ↳ Invite a guest speaker who can explore this with your students, such as a member of the local park or environment department, a Master Gardener, or a local conservation group.
- ↳ Become a Plant Needs scientist! Have students isolate a plant need (Light, Air, Water, Nutrients or Space). Have students design an experiment to observe the effects of withholding these needs from a plant, or giving varying levels of this need to a plant. For example, to test light, students might place one plant in a dark cupboard, one in a corner of the classroom and one at the window or under a grow light. Observe the effects!

Lesson #2: Movie Moment!

We All Have Needs! (Length: XX minutes)



Watch the video at: <link>



All living things have needs that must be met in order to live and grow. This video explores five important needs that all plants have to grow. The acronym **LAWNS** represents these important needs of: (L)ight, (A)ir temperature and movement, (W)ater, (N)utrients, and (S)pace to grow, such as in the soil. Almost all plants have these needs, but the amount of each need can vary depending on a plant's habitat. For example, plants in the desert need less water, while plants in the rainforest have adapted to survive with lots of water available. Students will discover how plant's needs can be met--both in nature and indoors--and explore how they can help care for plants and meet their needs too!

LAWNS

Science Review

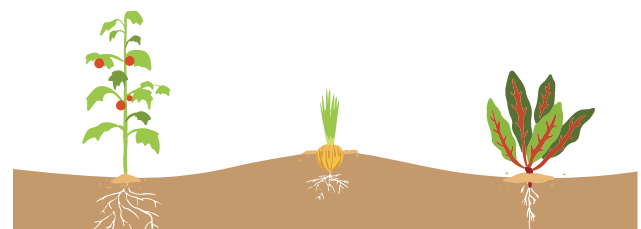
You may explore these science concepts further with students.

While all plants may have the same basic needs, each plant varies in how much of a particular need they require. For example, some plants need a lot of water, like a fern, but others need very little, like a cactus. Not all plants require lots of light--some like shade or diffused (filtered) light over full sunlight. Some plants, like

those in the desert, prefer dry air, while those in a rainforest prefer humid air. Some plants require a lot of nutrients, while other plants require very few nutrients.

When we take plants out of their natural habitat, humans must act as nature and help a plant to meet its needs. We see this in our gardens and on farms. Humans must help plants meet all of their needs in order to grow.

One way that we help support plants is by ensuring that they have enough nutrients to grow. As humans, we get our nutrients from the food we eat. Many plants absorb nutrients naturally from the soil, through their roots. At times, farmers must add additional nutrients through the use of fertilizers. Printed on the fertilizer packages you buy for your home garden, you might see three numbers listed, separated by a dash (ie. 10-7-3). These numbers represent the concentration of 3 very important plant nutrients, known as macronutrients. These numbers are commonly referred to as the "N-P-K" number, which stands for Nitrogen-Phosphorus-Potassium. These nutrients play very important roles for helping maintain plant health.



Teacher Background

Expand Your Worldview

- **Nitrogen (N)** is responsible for leafy green foliage or lushness
- **Phosphorous (P)** to support plant roots and blooms
- **Potassium (K)** an overall helpful nutrient and used especially for supporting plants during dormant winters.

Explore plant nutrients further with the Little Green Thumbs Plant Nutrients Poster, available online.



Stop & Check!

Pause the video at this timestamp to check for your students' understanding.

- What does a plant need to grow? [00:26]
- How can you tell a plant is meeting its needs? [02:50]
- After the video check for understanding: What does LAWNS stand for?

Indigenous Connections:

Gardeners can thank generations of Indigenous people across North America who discovered the perfect gardening combination found in the "Three Sisters". Corn, beans and squash are grown together for a perfect harmony of plant needs coming together. The tall corn stalks provide a space for the bean plants to grow up, and the beans in turn provide more stability for the corn stalk in windy conditions. As a legume, beans fix nitrogen in the soil, providing fertilizer for the other plants. The ground coverage from



Sight Words to look out for:

- | | | |
|-------------|---------------|------------------|
| • Light | • Space | • Crowded |
| • Air | • Absorbed | • Carbon Dioxide |
| • Water | • Temperature | |
| • Nutrients | • Fertilizer | |

the squash leaves keeps out weeds and prevents the soil from drying out.

This kind of complementary planting and harmony between different needs was improved with a legacy of seed collecting and saving of southern First Nations communities including Ojibwe, Anishinaabe, Algonquin, and Mi'kmaq. Many of the specific heritage varieties of vegetables they saved are still grown today.



The Three Sisters Teacher's Manual from LGT

Explore the story of the Three Sisters with your students.

The Three Sisters, Strong Nations

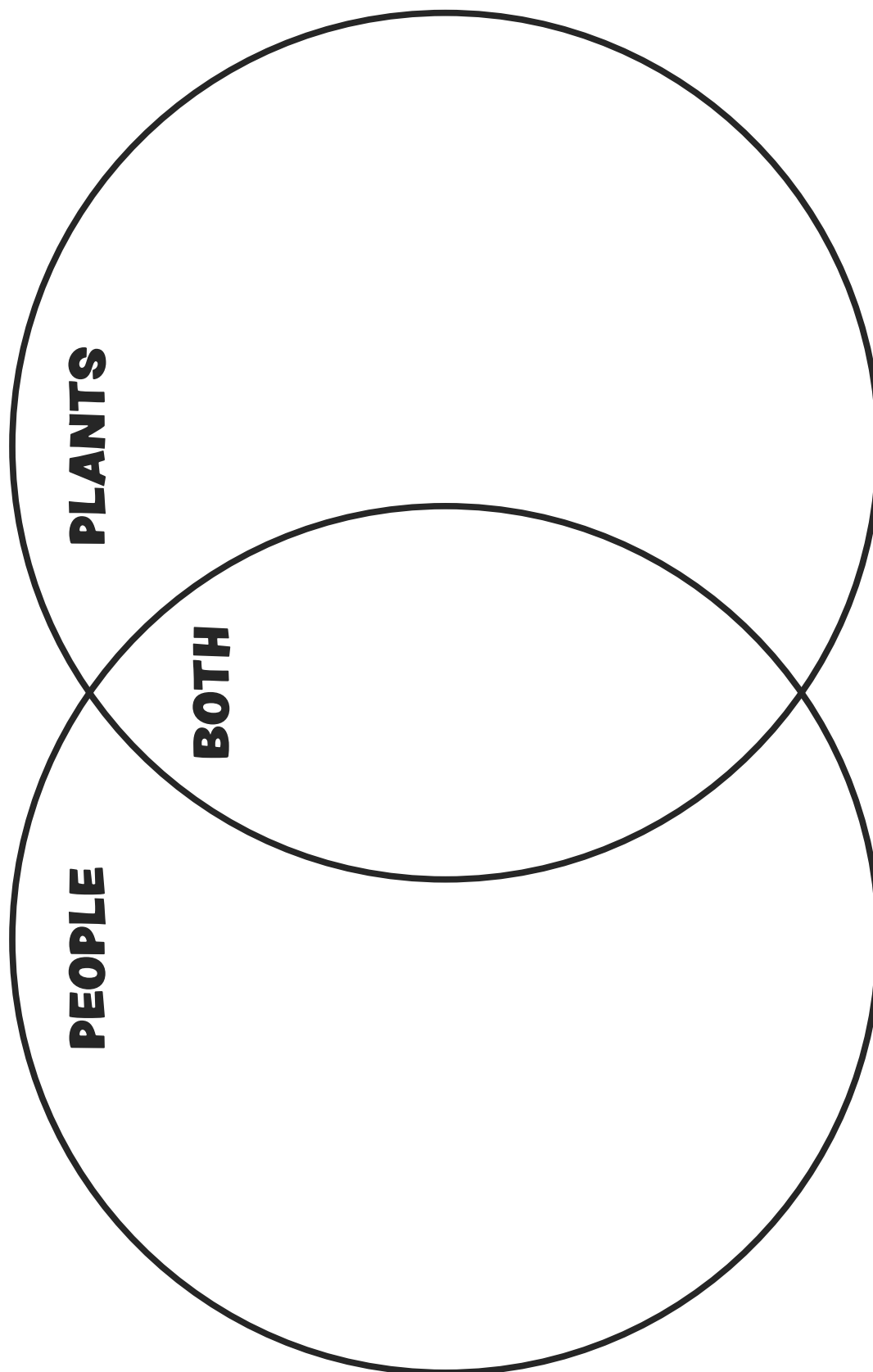
Look for the online story about the three sisters starting as sisters.



Activity 1: Plant Needs & Human Needs

Venn Diagram

02



Activity 2: Plant Health Chart

Check on the health of a plant near you! Use this healthy plant checklist to inspect your patient.



Patient:

Name:



LIGHT

Check the leaves!

Excellent

Good

Poor

Unsure

- Leaves are the same colour - no yellow leaves.
- Leaves are not shrivelled up, dry, or cracking.
- Leaves are not spotty.



AIR

Check the air!

Excellent

Good

Poor

Unsure

- Air temperature is good.
- Plant is not too close or far away from heat.
- There is no extreme wind or air circulation.



WATER

Check the soil!

Excellent

Good

Poor

Unsure

- Soil next to the plant is not too moist.
- Soil next to the plant is not too dry.



NUTRIENTS

Check the stem!

Excellent

Good

Poor

Unsure

- There are no pests on the stem.
- The plant has been fertilized, if need be.



SPACE

Check its surroundings!

Excellent

Good

Poor

Unsure

- Other plants are not crowding its place.
- The roots have enough room to grow in its pot (for potted plants)

Additional Notes:

Lesson #3: Great Adaptations

How Plants Adapt to Different Environments

03

Big Idea



Being able to adapt to any situation is very useful, especially if you are a plant. Just like humans, plants become well-equipped to survive in the conditions around them. Developing special adaptations such as longer roots, big broad leaves, stems filled with extra water reserves, or growing taller than their neighbours are all helpful for a plant's survival.



Suggested Steps:

1. We recommend starting with the discussion in the first activity.
2. Afterwards, watch the video to learn more about specific plant adaptations.
3. If time allows, do the second activity.
4. Close the lesson with a journal reflection prompt or My Climate Story handout.

Guiding Questions:

- What physical attributes and behaviours do plants have to survive in different areas?
- What plants grow in different habitats?
- How do plants help support and depend on the environment they are in?

Learning Objectives

I know (knowledge), I can (skills), I understand (conceptual understanding)



I KNOW

- Some examples of different climates that require plant adaptations.
- The difference between native, introduced, and invasive plants/species.



I CAN

- Suggest creative ways that plants can meet their needs through adaptations.
- Identify specific plant parts, such as roots, stems, or leaves, and how they can adapt.



I UNDERSTAND

- How different environments pose different challenges for plants and humans to survive.
- The role humans play in speeding up plant adaptation for us in agriculture and other uses.

Lesson #3: Great Adaptations

Activity 1: I'm Going On An Adventure! (Survival Wear)

Time: 25 mins

Process: 8 steps



Materials Needed:

- Flip Chart paper or whiteboard and markers
- Page with habitats listed

1. Before beginning the activity, think of a commonly-known environment, such as a desert, rainforest, jungle, farm, etc. Don't reveal your choice to the students.
2. Explain to the students that they will have to guess what environment (or location) you are thinking of by thinking about the clothing and other gear you are going to bring.
3. There are two options for guessing. The first is to slowly list off some of the gear and clothing you would bring, repeating the phrase "I'm going on an adventure and I'm bringing" Start to ask the class for their guesses after listing off 3-4 items.
4. The other option is to have students think of an item to complete the sentence "I'm going on an adventure and I'm bringing ..." The teacher then thinks about whether the item is appropriate to bring with them to the environment, and tells them "Yes, you can come," or "Sorry, you can't come!"
5. Once students have guessed the environment correctly, ask another student to model the same structure and see if you can guess their mystery environment.
6. Note down sight words and ask your students some prompts on why they chose particular clothing and gear. What were their considerations? Weather? Access to food and water? Dangers? Anything else?

7. Explain to your students that plants have to have certain modifications or 'superpowers' of their own to survive where they are. Can we think of any special abilities they may need, like us and our clothing and gear choices? Why would they need these special abilities?
8. Close by noting their ideas down and revisiting them later to see if they have any other ideas to add.



Accommodations or Extensions

- ↳ As a review activity -or if they are restless and want to get moving- have students go in pairs or trios and take turns being the guesser or the leader. You may want to list some environments for them first to have as inspiration.

Lesson #3: Great Adaptations

Activity 2: Ready, Set, Grow Roleplay

Time: 30 mins

Process: 11 steps



Materials Needed:

- “Plant Personality” Sheet (one per student)
- Rope or string (enough to make one necklace per student)
- Pencil, pen and/or markers
- “Plant Environment” Posters printed, single or double-sided.

Discussion

1. Ask your students to think about the different needs of plants, and the different parts of plants that may be bigger or smaller to help support that plant meeting its needs.
2. Draw out a simple plant and ask students to identify the parts. What plant parts might need to change to help so all of the plants' needs are met? We call these adaptations.
3. Go through each of a plant's needs and think about possible adaptations together. What about getting more light? How about staying warm or cool from air temperatures? What about too much or too little space, water or nutrients? Jot down some of their ideas.
7. Go over each of the different areas, and ask students to do a drawing of an imaginary plant on the worksheet. Then, fill in how much or how little of each need their imaginary plant requires. After, cut out and holepunch their plant info cards, making small necklaces for the students to wear.
8. Set up a four-corners style game in the classroom, with four of the different “Plant Environment” mini-posters on the walls.
9. Ask students to ‘walk like a plant’ over to each environment and think about which one would be best for them to live in. After a few minutes, countdown to 10 and have the students go to their ideal environment (corner).
10. Discuss why they chose the environment they did, and who their neighbours are. Did they also have similar needs to you?



Activity

4. For this activity, each of your students will roleplay a plant with different adaptation features.
5. Start by handing out the “Plant Personalities” worksheet and walk students through the different diagrams.
6. Tell students they each will pretend to be a different plant. Just like when you buy a plant at a store or plant from a seeds, a label indicates what kinds of conditions you do best in.
11. If time allows, switch each of the mini-posters to new environments and do the activity one more time.

Accommodations or Extensions

- ↳ What do you think your imaginary plant would look like if it was real? Draw it in your journal as a reflection.
- ↳ With the right materials, you can adapt this activity into more of a dress-up roleplay. Try giving students different sized strings to represent roots attached to pant belt loops and create, create paper crowns with different leaf sizes. Use blue felt or construction paper water droplets attached with clothespins for water, aluminium foil bracelets for light, and NPK circle badges for the amount of nutrients they need. They can walk like giants or very tiny plants to show how much space they need!

Lesson #3: Weather Warriors

My Climate Story Reflection



As part of planting seeds for climate stories, your students are developing their own story to help them walk through their role in climate change. You can use this assignment in place of -or to support- a journal reflection.

The companion worksheet for developing My Climate Story for this lesson asks your students about the choices they make. We can make healthy choices in how we treat others and ourselves, and these choices have an impact. This also includes the choices we can make that will help the planet stay healthy too, including plants!

For further guidelines on helping your students develop their own Climate Story, check out the explanation in the Teacher's Guide (page #).

Reflection/Journal Prompts

- If you had adaptation powers like a plant, what would you be really good at?
- Describe and/or draw a plant you think would be helpful if you moved to another planet.
- How can you keep plants safe from invasive plants?



Assessment/Evaluation

Formative evaluation can be done through noting student suggestions and participation in both activities. Both worksheets can assist with summative evaluation, as well as the journal or reflection questions.

Extension Activities:

- ↳ Consider "Adopting a native plant" as a class or for each individual student. Research and learn more about the adaptations of a native plant near you, and build an awareness campaign so others will be able to identify and protect it in the natural spaces around them. You may even want to grow some seeds in the classroom!
- ↳ Invasive plants are all around us. Bring in some examples and explore with your students what characteristics they have that have made them successful in your community (for example purple loosestrife can produce over a million in a single growing season) Provide information to others on how to prevent their spread.

Lesson #3: Movie Moment!

Great Adaptations (Length: XX minutes)



Watch the video at: <link>



Plants are found in nearly every ecosystem on Earth. Plants can survive This video introduces students to the different ways that plants have developed adaptations to best survive in different ecosystems. Connecting back to plant needs, we explore desert and rainforest ecosystems as two examples of extreme water and light differences that make leaf shape, size, and water storage all essential for plants in these areas. Students will explore the differences between native plants, introduced - or exotic plants - and when these plants become invasive to the ecosystems around them through introduction into similar climates but different geographical locations. Finally, the video closes with briefly exploring modern plant science and how plant adaptations are developed rapidly for commercial uses such as agriculture.

Science Review

Here are a few science extensions you may want to explore further:

There are a number of great plant adaptation stories from across Canada. For example, many seeds will wait until they have a certain amount of light water, and nutrients to germinate. For example, seeds are released from the cones of Jack pines after a fire. They then rely on the wind to move, and take up root in burned forests where overcrowding is no longer an issue.

Canada's closest version of the popular bug-eating Venus Fly Trap is the pitcher plant, which grows in bogs with high acidity and very little nutrients. They make up for the nutrient-poor conditions around them by taking the nutrients from bugs and insects that fall down their tubes.

Many of the plants we can commonly identify were introduced to our country, with their origins from all over the world and centuries of selective breeding -or artificial selection- to ensure the best traits -and adaptations could be created.

Not every introduced plant has been successful in a new climate without particular care of gardeners or farmers. Others, however, have been far too successful, and now are invasive species that are detrimental to ecosystems and biodiversity of many species, including plants. Some examples across the country include purple loosestrife, giant hogweed, or the Himalayan blackberry in the Pacific Northwest. The success of these plants' spread is through their adaptations, along with their beauty attracting unbeknownst travelling gardeners and importers.



Teacher Background

Expand Your Worldview

03

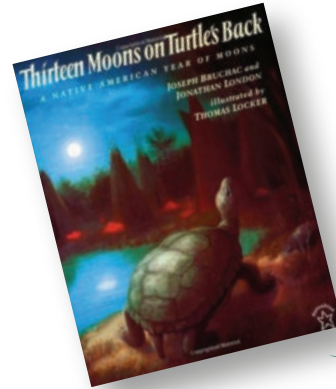
Indigenous Connections:

Plants have adapted to different environmental conditions, and so have local Indigenous communities to that place.

The lunar calendars of different Indigenous communities align with significant changes of the season, many of which involve plants. 13 moons calendar – specific to area depending on the climate – Aniishnabe eg. Has raspberry, corn and harvest. Northern Moon. – blueberry picking up north. Based on the turtle back – there are 13 larger on the turtle's back.

Ontario Native Literacy Coalition has Cree, Ojibwe & Algonquin 13 Moons in this PDF:
<https://onlc.ca/resource-post/thirteen-moons-practitioners-guide-lbs-levels-2-3/>

Cree 13 moons Soloman Ratt First Nations
<https://nativereflections.ca/collections/books/products/nrb-62>



Thirteen Moons On the Turtle's Back



Sight Words to look out for:

- Adaptation
- Survive
- Desert
- Evaporate
- Rainforest
- Canopy
- Surface
- Native Plant
- Introduced
- Invasive plant

Stop & Check!

Pause the video at this timestamp to check for your students' understanding.

- Have you ever wondered how plants can grow in such different habitats? [00:15]
- Look at the plants around you! What special features do the plants around you have to help them survive? [00:00]
- What special features do the plants around you have to help them survive?

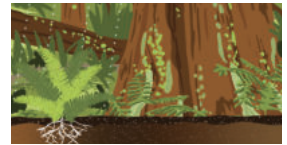
Activity 1: I'm Going On An Adventure

03

Desert



Rainforest



Farm



Boreal Forest



Coast



City



The Arctic



Marsh



Plant Personality

Cut along this line

The name of my plant is:

My name is:

My plants unique needs:


Sun/Shade

Water

Airflow

Nutrients

Space

 Little
GreenThumbs

The name of my plant is:

My name is:

My plants unique needs:


Sun/Shade

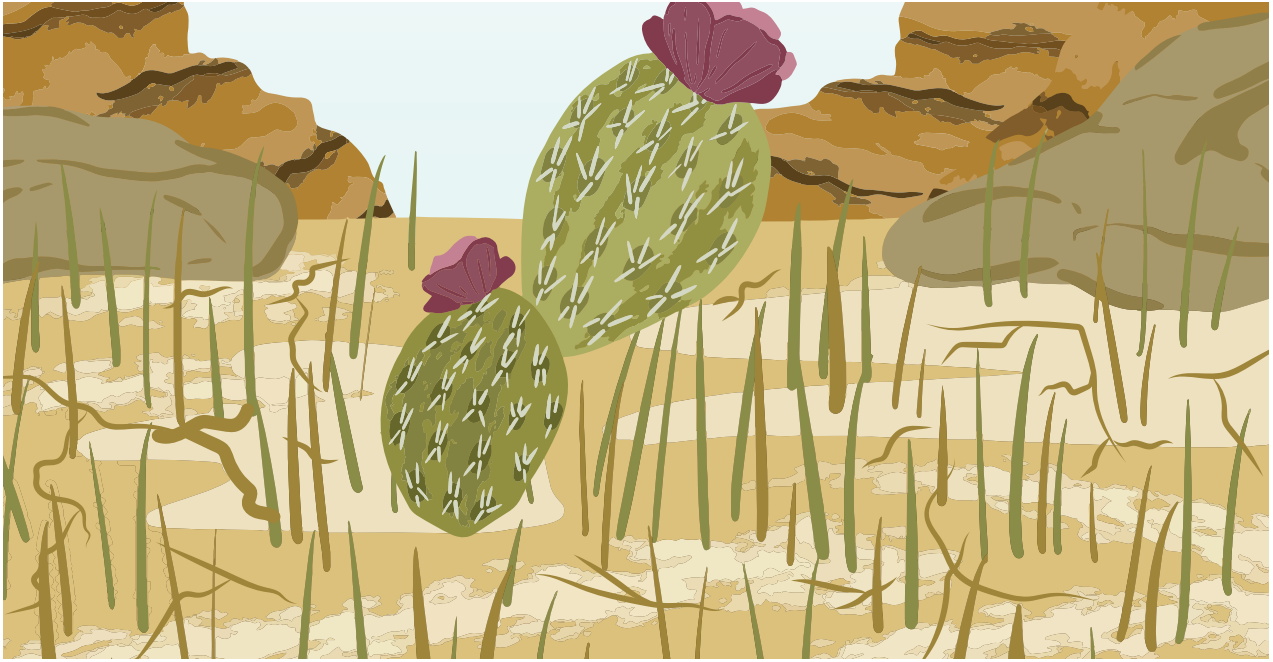
Water

Airflow

Nutrients

Space

 Little
GreenThumbs



Desert



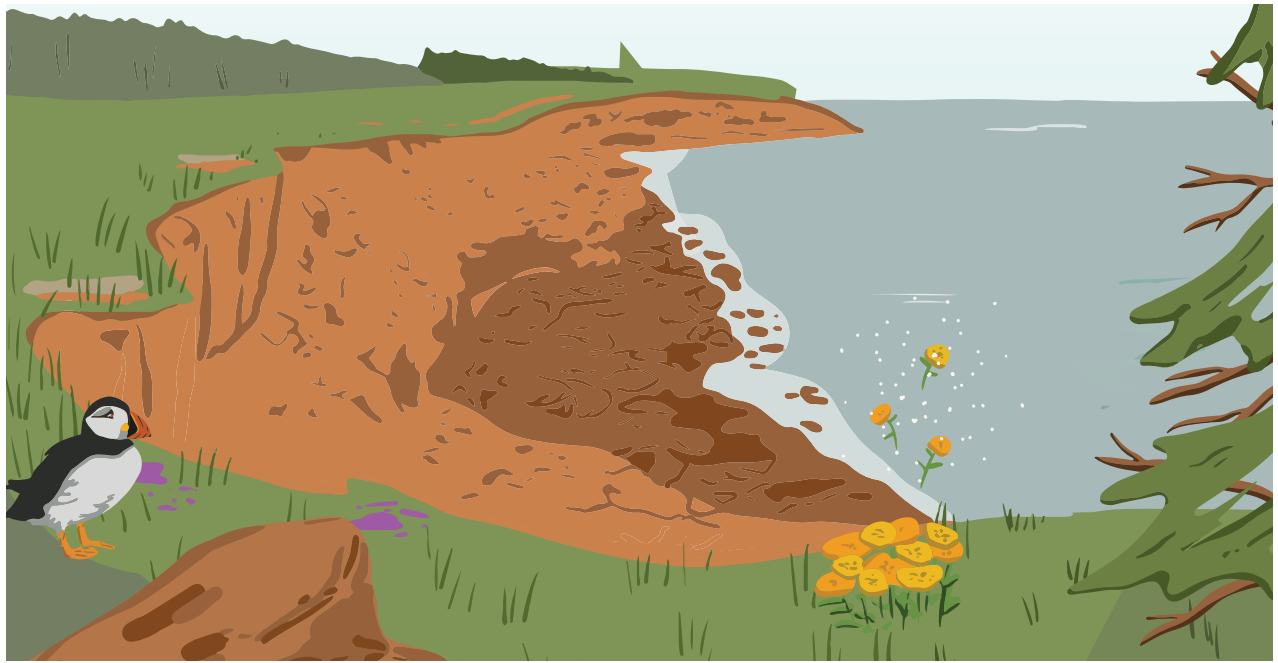
Rainforest



Farm



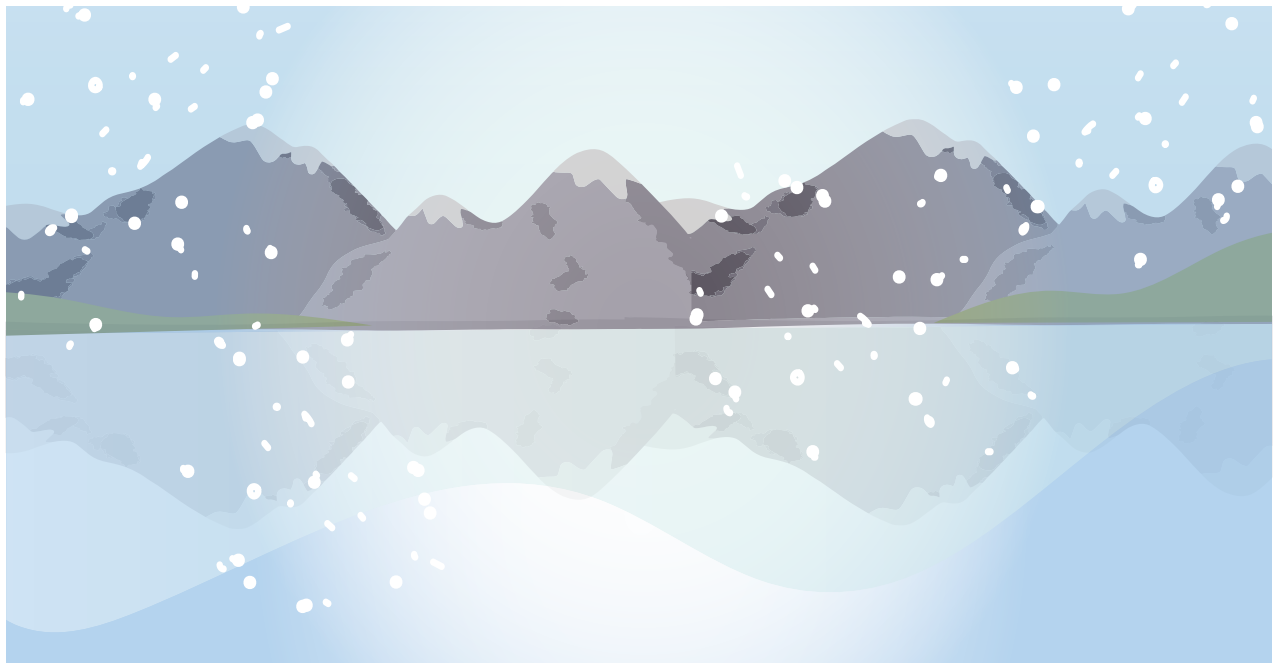
Boreal Forest



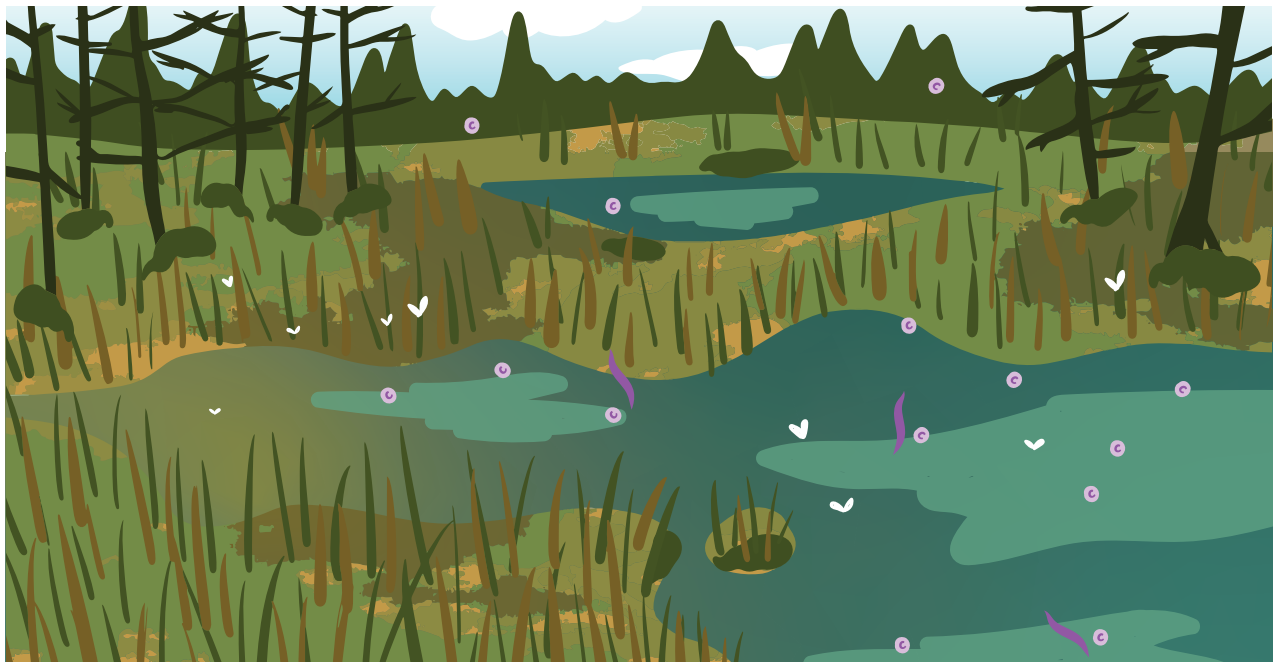
Coast



City



The Arctic



Marsh

Lesson #4: Changes All Around Us

Greenhouse Effect Experiment & Caring for Plants in a Changing Climate

04

Big Idea



Climate change can be a complex topic. We use plants as an entry point into conversations about a changing climate. Support your students for deeper conversations by blending science exploration with personal feelings around climate change to create a supportive -and hopeful- classroom atmosphere.



Suggested Steps:

1. Start by setting up the greenhouse effect experiment, heading up the experiment tray.
2. Watch the Climate Change Introduction video and return back to the first activity.
3. Have a class sharing circle to talk about feelings and questions around climate change.
4. Watch the Climate Change High Five video.
5. Close the lesson with a journal reflection prompt or My Climate Story handout.

Guiding Questions:

- What is climate change?
- How does climate change affect all living things, including humans & plants?
- How are humans involved in climate change?



Learning Objectives

I know (knowledge), I can (skills), I understand (conceptual understanding)



I KNOW

- ↳ The science behind climate change in the warming of gases in the atmosphere.
- ↳ That climate change affects all living things on Earth.



I CAN

- ↳ Express difficult feelings about climate change
- ↳ Look for support from other people, including my teacher, to discuss climate change.



I UNDERSTAND

- ↳ The connection that climate change has between humans, plants, and other living things.
- ↳ That my feelings about climate change are OK to have, and can help me to take action.

Lesson #4: Changes All Around Us

Activity 1: Greenhouse Side Effect Science Experiment

(Thermometer, plant domes, jars)

Time: 25 mins

Process: 10 steps



Materials Needed:

- 1-2 trays or plant pots filled with soil and/or plants that can be covered
- 1-2 clear lids to demonstrate
- Some water to put in the trays
- A quick heat source, such as an accessible lit lightbulb, or windowsill.
- A thermometer (optional)

Process

1. Ask your students to imagine a greenhouse. Have they been one before? What do they notice about the temperature in a greenhouse? How do they feel? How do the plants feel? Do they feel a bit hot and sticky? What do we call this wet air? (humidity)
2. Now ask about the outdoors. Where do they think the warm air goes when the sun goes away? Does it go up into space, or further? Where does the air outside meet outer space?
3. Connect the ideas of the atmosphere and the air outside. Tell students they are going to do a simple experiment to show how a greenhouse works (and on a larger scale, our whole planet).
4. Measure the temperature of the air next to the soil in the tray or pot. If you don't have a thermometer, ask your students to place their hand above the soil and ask about the air temperature. Is it different from the rest of the room? If not, we can say it is roughly room temperature.
5. Now add some water to the tray, and cover it. Find a warm, bright lightbulb that you can put the tray close to. You may need to leave the tray there for 10 minutes or more to really see the full effects compared to the tray before.
6. Revisit the tray after some time, and gather the class around. What do they notice about the tray? Does it feel warmer? Are there water drops inside the cover of the tray?
7. Explain that the Earth's atmosphere holds water vapour in the atmosphere and other gases like carbon dioxide just like the plant tray does.
8. Now measure the temperature inside the tray. As you slowly open it, do you feel the heat escape? Record the temperature and note the difference from before and after. What happened?
9. Connect this activity to the climate change video as part of this lesson. If less heat from the heat source (the sun) escapes outside (back into space) what happens under the glass (or within our atmosphere?)
10. Close the activity with reminding students of the balance between having some heat escape, (with a bit of an opening in the tray) so that plants can live comfortably inside (like us on Earth with the atmosphere). This transfer of some heat absorbed in the tray, and some reflected out via the plastic layer is why we call this "the greenhouse effect".



Lesson #4: Changes All Around Us

Activity 2: My Feelings About Climate Change Discussion

Time: 25 mins

Process: 10 steps

Materials Needed:

- Sharing is Caring Reflection Question handout for reference *(optional)*
- Whiteboard or chart paper to write down feelings *(optional)*
- Markers for writing *(optional)*
- A stone, or other item to designate who will talk *(optional)*



Process

1. Climate change is a complex topic. Gather your class together for a discussion and debrief about what they saw and learned in this lesson.
2. Determine how you'd like students to contribute their responses, either through raising a hand, or passing a stone or other item for designate that person gets to speak.
3. Begin with asking some questions to check for prior knowledge on climate change, either from the class experiment and video, or from elsewhere. Ask your class what they know about climate change. What did they learn today? What have they heard before? What about actions in general that are not good for the planet, or unhealthy?
4. Write out a list of facts or questions they might have, and try to address them when they come up. If you don't know the answer, or think some answers may need more explanation, tell your students. Part of this discussion is admitting to your students that you don't have all the answers either, but you are learning together, and you will look up more information if you need to.
5. Move on to unpacking your students' feelings. Ask your students how they feel when they hear about the impacts of climate change. What positive emotions does it make them feel? What negative emotions? What feelings do they have that might not be either positive or negative? Ask them why they feel the way they do.
6. After you've shared together some of the feelings in the classroom, move on to imagining what we can all do together to make the world a better place. Ask your students what they might do to make the planet and all living things on it healthier. If useful, begin with plants and the habitats they live in around your school and area. List a few down if this is helpful. (Noe: you may want to refer back to these ideas if you plan to do an action project (as outlined in Lesson 8: TITLE.)
7. Now turn to your classroom and your day-to-day activities at school. Ask your students if there are any projects or actions they could do to help plants, people, and the planet in their every day. Write down these solutions and actions as well.
8. Close by returning to an emotional check-in. After thinking through solutions, does everyone feel a bit better? Are there any new emotions you are feeling?
9. Remind students that it's OK to feel different emotions, and sometimes they may not always be happy, and we can feel more than one emotion at a time about complex things. Reinforce that we can choose how we react and feel to different things, even if they are difficult.
10. Close by reinforcing that if we stay optimistic and look for solutions, we can find them together!

Lesson #4: Changes All Around Us

My Climate Story Reflection



As part of planting seeds for climate stories, your students are developing their own story to help them walk through their role in climate change. You can use this assignment in place of -or to support- a journal reflection.

The worksheet for developing My Climate Story for this lesson focuses on five key messages to remember about climate change in the form of a High Five. It can be used to help facilitate class understanding and empowerment around climate change that is discussed in this lesson. Depending on your students, you may want to do this either together, or in partners or small groups.

For further guidelines on helping your students develop their own Climate Story, check out the explanation in the Teacher's Guide (page #).



Reflection/Journal Prompts

- Write about a feeling you feel when thinking about climate change. Why do you feel that way?
- Imagine the day of a plant in extreme weather. How does it survive?
- Write about an action you have seen someone to do that is good for the Earth.

Assessment/Evaluation

Use the greenhouse activity as an opportunity to assess your students' critical thinking and work. During the discussion on climate change, check on your student's reactions. Keep the tone constructive, but also ensure that everyone is feeling OK and no one is sitting with negative emotions at the end of the discussion. Finally, Ending with a journal or other reflection can be used for formative or summative evaluation.

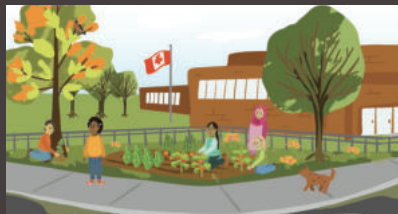
Extension Activities:

- ↳ Debunking myths about climate change at the beginning of this lesson may be helpful. Brainstorm with your students different reasons why people are skeptical about climate change, and think of solutions together to address people's concerns.
- ↳ There are great connections to Geography in learning about climate change. With your students, explore the way that your local region is being impacted by climate change using maps projecting future changes to the environment from impact data from Environment Canada, or through local government agencies, researchers, or climate action hubs.
- ↳ For older students you may be able to assess the largest climate change impacts in different ways. We suggest starting with a graffiti activity with students going around the room, drawing or writing their reactions to different climate change-connected prompts.



Lesson #3: Changes All Around Us

Movie Moment!



This video introduces students to the concept of climate change. This includes how plants and humans are dependent on the balance of greenhouse gases such as carbon in the atmosphere. This ensures the planet stays at a stable temperature so that plants, animals and people can survive.

Science Review

Please read the **Climate Change background in the Plants, People, Planet Teacher's Guide for an overview of the known causes of Climate Change.**

Let's Talk Energy

Check out the Climate Change infographics created by Ingenium.

https://energy.techno-science.ca/doc/content/Climate-Change_EN.pdf



This video has a few science extensions that are worth noting and exploring further with some classrooms.

We often hear two terms used interchangeably: Climate Change and Global Warming. Both terms are used to explain how the earth's climate (long-term weather patterns in an area) is rapidly changing and warming. While many of the most disastrous effects of Climate Change

are due to the rise of global temperatures, Climate Change can result in both abnormally hot and cold weather. The complexities of Climate Change may become too simplified and lead to misunderstandings when we refer only to Global Warming.

Greenhouse gases are a major contributor to Climate Change and the rise of global temperatures. Without any intervention, our current rate of global greenhouse gas emissions would result in a disastrous 4 degrees Celsius rise of the average global temperature by the end of this century. Scientists internationally agree that we need to stay below a 2 degree rise to curb the worst of Climate Change impacts.

While overall the planet is warming, different geographic regions feel the effects of Climate Change differently. Climate change effects weather patterns over time, including air temperature and precipitation, and therefore some parts of the country will warm or cool, depending on local geographical features as well. Because of this, it is difficult to make general assumptions about Climate Change impacts across Canada. However, we do know that climate change is warming the Arctic twice as fast as the rest of the planet.

There are many effects of climate change on our environment, and our atmosphere. A warmer atmosphere can hold more moisture, and therefore extreme rain and snowstorms will have more water available to fall as precipitation. Increased duration and frequency

Movie Moment!

04

of extreme weather events such as snowstorms, hurricanes, forest fires, droughts and flooding all can be expected -and are already being connected to- climate change. When we talk about plants and animals, movements of certain species to different ecological zones will become more common. This disruption and entry of new species upsets the natural balance of species already in that area, especially as certain areas become too hot, and northern areas see milder, shorter winters.

What is the solution to climate change? There are many! The key culprit is fossil fuels. Fossil fuels make up our day-to-day lives and account for 70-90% of our human contribution to global greenhouse gas emissions. Transportation, manufacturing, generating electricity, and heating and cooling all are key sectors of our daily lives that use a great deal of fossil fuels. Agriculture and waste systems also produce greenhouse gas emissions, often shown with a cow flatulating, which releases methane. While we often talk about carbon dioxide as the main culprit of global warming, it's not alone. For example, methane is roughly 30 times more effective than carbon dioxide at trapping heat in the atmosphere. Nitrous oxide and water vapour are also some of the major greenhouse gases.

We will continue to explore the impacts of climate change over the course of the lessons. To explore more solutions, see Lesson 7: Solutions. [VERIFY TITLE]

Stop & Check!

Pause the video at this timestamp to check for your students' understanding.

- Do you know what climate means? [01:03]
- Can anyone explain the difference between climate and weather? [02:25]
- How does the Earth stay at the right climate? [03:22]



Sight Words to look out for:

- Climate
- Weather
- Habitats
- Atmosphere
- Sun
- Greenhouse gases
- Carbon Dioxide
- Oxygen
- Photosynthesis
- Energy

Indigenous Connections:

The idea of thinking seven generations ahead is often used in environmental messaging. The much broader notion of thinking long-term for the future is said to be first coined by Iroquois teachings, and is now commonplace language when thinking about our current impact on the planet.

This notion of conservation of resources for generations to come has been a staple in Indigenous worldview in Canada and across the world. Yet climate change is challenging this foundation. Climate change is impacting local Indigenous communities whose economies, traditions, and livelihoods often predominantly rely on the land. Stable, historically consistent weather for hunting and gathering plants and animals and transportation is now up in the air. Groups such as the Indigenous Climate Hub have been working to inform and connect Indigenous communities to the local effects of climate change, linking to Traditional Knowledge.

For more information on stories, resources, and other learnings, refer to our glossary of resources in the Teacher Guide.

Lessons From Mother Earth



Lesson #5: Plant Needs & Climate Change

Caring for Plants in a Changing Climate

05

Big Idea



Climate change is impacting everything around us, including plants. Learn more about signs of shifting plant needs and how climate change will continue to impact their ability to stay healthy. Finally, you'll reflect on the connections between different plants and the power we hold when we decide what to plant for a healthy planet.



Suggested Steps:

1. Begin by watching the video on plant needs and climate change.
2. Choose to do either the experiment or art analysis in any order you choose.
3. Close the lesson with a journal reflection prompt or My Climate Story handout.

Guiding Questions:

- How will climate change impact a plant's ability to meet its needs?
- What can we do to ensure plants can still meet their needs as the environment shifts?
- What power do we have in deciding what we plant in our community?

Learning Objectives

I know (knowledge), I can (skills), I understand (conceptual understanding)



I KNOW

- ↳ How climate and weather may affect a plant's needs.
- ↳ The risk of plants becoming endangered or moving because of climate change.



I CAN

- ↳ Identify the signs that a plant does not have its needs met.
- ↳ Predict how climate change will impact different plant needs.



I UNDERSTAND

- ↳ That both plants and other living things that rely on them will be impacted by climate change.
- ↳ How I can work with others to protect plants and the habitats they create/live in.

Lesson #5: Plant Needs & Climate Change

Activity 1: Plant Needs Experiment

Time: 30 mins

Process: 11 steps

Materials Needed:

- Five plants (*one for each mini experiment*), ideally the same type or similar. Or, one plant per small group.
- A cover or poorly-lit area for the light experiment.
- A cool place for the warm air experiment.
- A sunny place for the water experiment.
- A nutrient-poor soil heavy in sand, peat, or clay.

1. Ask your students if they remember the five different needs of plants: **LAWNS** (light, air, water, nutrients, and space).
2. Explain to students that today you will be looking at how plant needs can be changed by us in the class, to demonstrate the differences in nature. (*Note that this activity accompanies learning done in the Plant Doctor activity in Lesson #2- Plant Needs*).
3. Together with your students, set up the different plant needs stations. Decide whether you'd like to task a group of students to each be responsible for setting up and observing one station, or do all of them together as a class.
4. Ask your students as you set up each station how they might suggest you adjust the plant's needs. If each plant had one of their needs taken away, how would you do that?
5. Be open to students' suggestions for what they can do to impact the plants. Introduce the word *variable*. A variable is something in a science experiment that can be changed or adjusted. In this experiment, the variable you are changing each time is one of the plants' needs.
6. To help your students change the variables for each station, try covering a plant in a dark blanket, paper, or cupboard for light (L), putting it somewhere colder in place of warm air (A), and drying out the plant and pot for water (W). Both nutrients and space (N, S) needs may be more difficult to change, but could be replicated by moving the plant to a nutrient-poor soil, or repotting a plant with less soil.
7. Determine as a class an appropriate amount of time you'd like to pass until you will check your plants again. While you will not get as clear results in a few days, your plants will have a higher chance of recovering from the experiment.
8. Reassure your students that you will try to return the plants to a healthy state after the experiment, as best as you can. Plants are used to adaptation, though not every plant lasts in nature, and that's OK.
9. Connect back to climate change and plant needs. Ask your students what they think might happen when more than one plant need is not met in nature, especially due to climate change?
10. Remind students that climate change will combine some of these variables and make some of these needs become more extreme: whether it is flash flooding or drought, warmer or cooler air, etc. In this way we may not always see climate change impacts on plants right away, but more extreme weather is usually a clear sign that we can see impacting plants.
11. Close the activity by emphasizing steps you can take for plants under your care, and in your communities.

Lesson #5: Plant Needs & Climate Change

Activity 2: Ready, Set, Grow Roleplay

Time: 20 mins

Process: 7 steps

Materials Needed:

- Copy of So Much Depends on Who Holds the Shovel Painting to display

- If I Held the Shovel worksheet (optional)

1. Ask your students if they have ever planted anything. What did they plant? Who were they with? Why did they choose to plant that particular plant?
2. Introduce the painting by Christi Belcourt. What do your students notice about the design and art style? Look closely at the way the shapes are painted? Have they ever seen this style of art before? Explain that Pointillism is a type of art that uses small dots to make up the artwork.
3. Explain that Christi is a Métis artist, and she uses an art style that resembles traditional Métis beadwork. Just like beads, she uses the tiny dots so her paintings almost look like they are sewn beads on the canvas.
4. Look at the different animals and plants on the painting. What do you notice about them? Can you recognize any different species or types of animals/plants in the painting? You may want to write these down for vocabulary and characteristics of a few (e.g. plants with round leaves, yellow blossoms, etc.)
5. Tell your students that the title of this painting is "So Much Depends on Who Holds the Shovel". Ask your students if they have ever planted anything. What did they plant? Who were they with? Why did they choose to plant that particular plant?
6. "Who holds the shovel" might also mean who gets to decide what was planted. What kinds of plants do different people choose, like a farmer, versus a city park worker, or someone in your family? Why might they make the choices they do?
7. All of the animals and plants in this painting are native plants and are living well together. Thinking about Christi, as a Métis woman, why might she have chosen the plants and animals she did in this painting? What did she decide to plan, or to protect, using her shovel?

Accommodations or Extensions

- If time allows, use the worksheet "If I held the shovel..." and ask your students to imagine their dream garden. Use the worksheet to draw/describe different plants you'd grow, and the corresponding animals, insects, and other living things that those plants would also support. Use the layers of Christi Belcourt's painting for inspiration!

Lesson #5: Plant Needs & Climate Change

My Climate Story Reflection



05

As part of planting seeds for climate stories, your students are developing their own story to help them walk through their role in climate change. You can use this assignment in place of -or to support- a journal reflection.

The worksheet for developing My Climate Story for this lesson asks your class to reflect on their individual feelings when they think of climate change and environmental harm. Circling emotions they feel in a deep waterway, this activity opens up a conversation about emotions and feelings to ensure your students feel supported, even when they may be dealing with difficult emotions.

For further guidelines on helping your students develop their own Climate Story, check out the explanation in the Teacher's Guide (page #).

Reflection/Journal Prompts

- Like plants, how will my needs be impacted by climate change and changing weather?
- What plants would you grow in your dream garden? What other living things would these plants support?
- Tell a creation or a discovery story about a plant, making it the hero.



Assessment/Evaluation

Have your students keep track of the changing plant needs and record their predictions at the end of the day. For the painting analysis, the accompanying worksheet and/or reflection piece can be used for summative assessment.

Extension Activities:

- ↳ Invite a guest speaker from your community who “gets to hold the shovel,” such as a local gardener, Indigenous Elder, or community green planner. Ask them what they plant and why, and any other considerations they make in choosing plants. Whose needs do they think are most important? Us in our community, local wildlife, biodiversity, or industry?
- ↳ If time allows, you might want to practice pointillism with your students. Provide a simple plant drawing or image and ask them to try out the method themselves. Pencils, paints, or a few markers work really well.
- ↳ Climate change will impact a number of different plants, especially harvested crops that we take for granted everyday. Brainstorm a common plant and think about the impacts that changing climate may have on it, such as coffee beans, bananas, or almonds. Explore each of the needs using the LAWNS acronym. For younger students, you may want to stick to common garden vegetables and fruits.

Lesson #6: Down to Earth

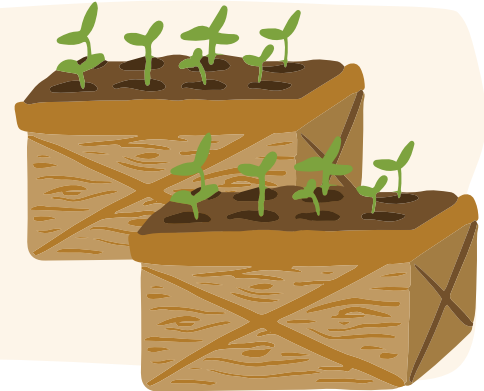
Soil as a Solution!



Big Idea



As we learn more about the complexities of the soil beneath our feet, we're discovering its huge role in storing nutrients, including carbon. We also know the importance of healthy soils to support plant and ecosystem life above and below the earth. Discover some ways to support our soil by creating seed bombs to protect soil from erosion, and learn more about the roots of plants in the soil below you!



Suggested Steps:

1. Start with the video or the first activity.
2. Afterwards, do the second activity.
3. Close the lesson with a journal reflection prompt or My Climate Story handout.

Guiding Questions:

- How do soil and plants work together?
- How is soil affected by climate change?
- How can we be good stewards of soil?

Learning Objectives

I know (knowledge), I can (skills), I understand (conceptual understanding)



I KNOW

- ↳ The soil beneath us is complex and comprises living and non-living things.
- ↳ Soil has an important role to play in storing carbon.



I CAN

- ↳ Differentiate between the different key components of soil.
- ↳ Compare different soils needed by plants and the role of their roots.



I UNDERSTAND

- ↳ That soil is a major climate change solution that I can help steward.
- ↳ There are many ways we can protect the soil on Earth and leave it undisturbed.

Lesson #6: Down to Earth

Activity 1: Bombs Away! (Making Seed Bombs)

Time: 40 mins

Process: 10 steps



Materials Needed:

- Powdered Clay
- Water
- A tray or location for drying
- Compost
- A mixing bowl *(one to make the recipe, more for small groups)*
- Small bags or containers *(for distribution and storage)*
- Wildflower seeds *(depending on location for planting)*
- Spoons *(optional, or use your hands!)*
- Measuring Cup

Process

1. This activity involves dirt and water. It might be messy, so choose the best location for your class.
2. Ask your students what kinds of wildflowers they have seen around them. What colour were they? What shape? Were they actually 'wild', or were they in a garden? Did they look like they belonged where they were?
3. Today you are going to make seed bombs together. Seed bombs are balls of seeds, clay, and soil that you can throw out into woods, ditches, or other spaces to help add some extra plants to areas.
4. Have your students think about important rules about seed bombs. What flowers would be appropriate to put in what places? How can we make sure we are choosing the right flowers for our environment? Where are good and bad places to throw them?
5. Extension: If time allows, you might want to research the best seeds for your location with your students. You also might want to bring in a local gardener or knowledge keeper who could introduce some wildflowers first.
6. Either divide the class into groups with their own bowls and spoons, or do all together. Just like a cooking show, you'll use your different ingredients to make the seed bombs.
7. Here's your recipe! Use a ratio of 1 cup of seeds to 5 cups of compost to 3-4 cups of clay, though you can be flexible with this. Start by mixing together the dirt and seeds. Then add in some of the powdered clay and slowly add a bit of water until you are able to roll the mixture into small, firm balls.
8. Set the bombs somewhere to dry out, and then distribute to your students.
9. Decide if you need to write out any instructions for someone using them. Are they meant for pollinators, or wildflower gardens, or the wild?
10. Remind your students about good and bad places to throw your bombs. Seed bombs also make a great present for the spring or summer months for someone in your community.

Tip!

Native plant seeds can be difficult to find. If you have trouble finding the right seed, switch to a different blend of more common seeds and make it for backyard pollinators, or a wildflower garden - just ensure none of the plants are invasive and you are planting in the right spot!

Lesson #6: Down to Earth

Activity 2: Roots & Storage

Time: 20 mins

Process: 13 steps



Materials Needed:

- Root Depth image printed, with root depth of plants portion folded behind.
- Root Depth Worksheet printed, with copies for small groups or each student (*optional*)
- Root Depth image without image of plants

above ground, and then entire image showing above ground and roots (*if displaying on a computer or projector*).

- Potted plant or plant that is showing its roots to introduce the activity (*optional*)

Process

1. With your students, look at a potted plant in the room or outside - what do you notice about the pot? How deep is it? Do you think the roots are sticking out at the bottom?
2. Explain that plants sometimes can surprise you. A lot of their growth is happening in their roots, as they extend out into the ground collecting water and nutrients for the plant.
3. Explain to your students that today you are going to try and guess how deep some common plant roots grow.
4. While we can see how high a plant gets and how wide it is above ground, how can we guess how deep their roots go? What would be some clues that might help us decide? (if needed, prompt about size of plant, soil, water, and nutrients in their location, etc.)
5. Introduce the Root Depth sheet. You can choose to work on this together, in small groups, or individually.
6. For each of the plants, estimate how deep you think the plants' roots might grow. Draw them to the measurement you think would be best (for younger students, you may need to demonstrate measurements using a student or adult to measure by meters).
7. Alternative: for younger students, you may want to simply have the students number the plants from shallowest to deepest roots.
8. Review as a class and see how well everyone did by unveiling the answers (the complete root system image below the plants). Review with your students: were the plants that you thought had the deepest roots correct? Did any surprise you?
9. Looking at the grasses in particular, ask your students why they think the one grass had such deep roots? Provide hints to consider where some of these plants might live (windy or dry areas with lots of soil erosion), or how they might reproduce (if they do not have flowers). Can they think of any other good reasons?
10. Use a common lawn grass as a comparison, usually only with roots 3-6 inches deep. When thinking about soil, how might deeper roots help make healthier soil (more nutrients and water storage in the plant's roots, transforming nutrients and providing space and organic matter for organisms to break down matter into nutrients).
11. Why do you think some plants had much deeper roots than you may have thought?
12. Recalling the soil health video, how is this soil (and the plants) a solution to climate change (stores lots of carbon and prevents soil/land erosion for increased biodiversity).
12. To close the conversation, ask your students to think of solutions to treat the soil below us properly, and to protect plant roots. What can we do together?

Lesson #6: Down to Earth

My Climate Story Reflection



As part of planting seeds for climate stories, your students are developing their own story to help them walk through their role in climate change. You can use this assignment in place of -or to support- a journal reflection.

The worksheet for developing My Climate Story for this lesson asks your students to explore the stories of climate action heroes who are stewarding and protecting soil. Using their head, heart, hands and feet, students will learn about the climate story of another person, familiarizing them with a template to create their own climate story at the end of the unit.

For further guidelines on helping your students develop their own Climate Story, check out the explanation in the Teacher's Guide.

Reflection/Journal Prompts

- Pretend the soil is a creature. How would you describe a day in its life?
- Share a story of digging for buried treasure. What did you find instead below the soil?
- Write a poem about the roots of a plant.

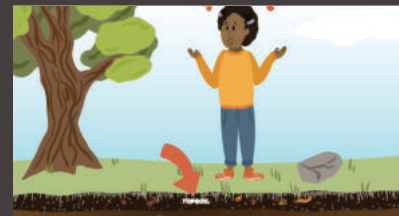
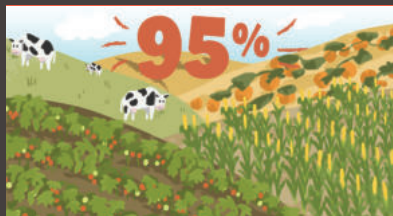


Extension Activities:

- ↳ Try filtering water through different soils to explore how a balanced soil retains moisture. Use different weights and types of mineral/soil blends to demonstrate this, such as rocks, bone meal or sand, heavy clay, and outside soil.
- ↳ Use the example of an apple to demonstrate the amount of arable land on the planet [[link to video](#)]
- ↳ Soil painting.
- ↳ Shake up a jar of soil with water and you'll be able to see the separation of sand, silt, and clay in the jar as it settles.

Lesson #6: Down to Earth

Movie Moment!



Below your feet lies one of our biggest solutions to climate change. Soil provides nutrients and a foundation for most of the plants on earth, but its capabilities are more complex than that. This video outlines the use of soil for plant health and its ability to store carbon. It outlines the movement of carbon through plants and soil, emphasizing that protecting soil and limiting its disturbance will allow it to continue providing nutrients and carbon storage to keep our planet balanced.

Science Review

This video has a few science extensions that are worth noting and exploring further with some classrooms:

We are still learning so much about the complex relationships going on within our soil.

All soil consists of four primary things: minerals, air, water, and organic matter. The minerals include three things: clay, silt and sand. The balance between these different minerals allows a substance that is porous (space for water and air to pass through), but solid enough to remain stable and supportive. Within the soil lies a great deal of stored carbon from organic matter, from dead plants, animals, and other organisms. It is estimated that there is three times more carbon stored in the soil than in the atmosphere, and four times more than all living plants and animals. That's a lot of carbon!

For the purpose of explaining climate change, the carbon cycle is focused on in these lessons and videos. Carbon cycles through soil and into living things, as does other micronutrients (like nitrogen cycle, discussed in later grades).



The Dirt on Soil Classroom Poster

Humans get the vitamins and energy they need in part from the life-supporting properties of soil. Plants get their energy from the soil, but the energy comes from the sun. Without the right nutrients, they are unable to survive. The key three are nitrogen, phosphorous and potassium, though any gardener will tell you that there are many other micronutrients working within a healthy soil to support life.

While weather can impact the dryness or wetness of soil, human-caused disturbances are also a serious threat to soil health. Overtilling and other unsustainable agriculture practices can damage topsoil and the microorganisms

Movie Moment!

06

working within it to break down the soil. Increased urbanization into arable, nutrient-rich land is also a major challenge.

It's important to look for solutions to ensure we protect healthy soil so it can do its important job of storing carbon dioxide. As a best practice and learning opportunity, try composting! Composting is an excellent example of supporting the conversion of nutrient-rich organic matter into soil.

Indigenous Connections:

I understandings with suggested resources, stories, articles, and poems:

[https://www.spiritsd.ca/learningresources/FNM%20Resources/GR3%20Soil%20Integration,%20In16%20\(2\).pdf](https://www.spiritsd.ca/learningresources/FNM%20Resources/GR3%20Soil%20Integration,%20In16%20(2).pdf)

For more information on stories, resources, and other learnings, refer to our glossary of resources in the Teacher Guide.

Stop & Check!

Pause the video at this timestamp to check for your students' understanding.

- Just what is soil anyways? [00:50]
- What does soil look like where you live? [03:00]



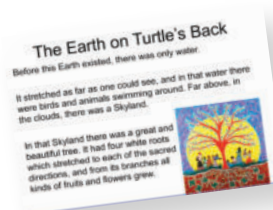
Sight Words to look out for:

- Soil
- Minerals
- Organic Matter
- Nutrients
- Fossil Fuels
- Electricity
- Transportation
- Carbon Dioxide
- Greenhouse Gasses
- Atmosphere
- Temperature
- Carbon Sink
- Scientist
- Disturb



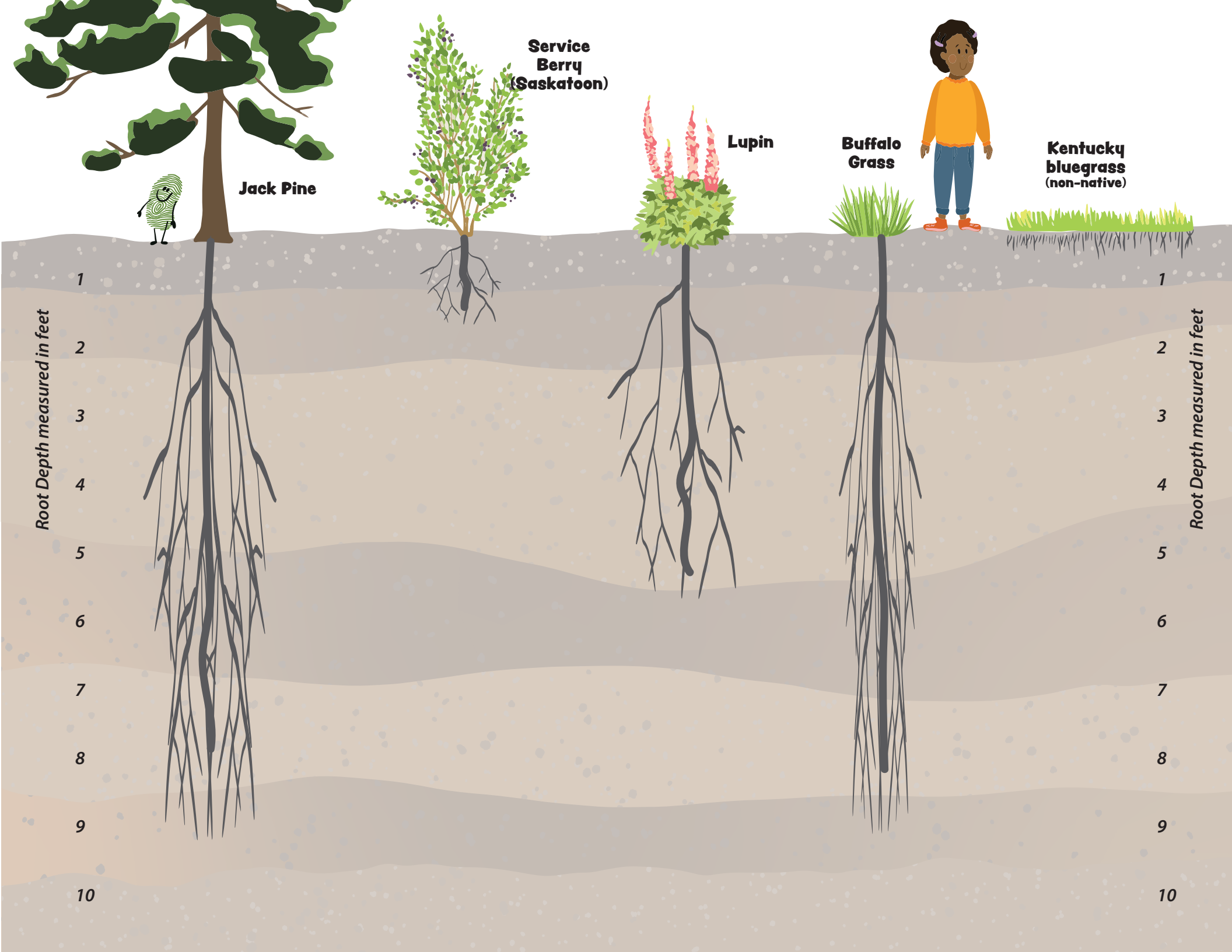
Relatives With Roots
by Leah Dorian

A Métis grandmother and granddaughter explore the Métis worldview through traditional medicines.



Agriculture in the Classroom Slideshow with Leah Dorian

<https://www.dropbox.com/s/0d3loadrk6224vo/The%20Earth%20on%20Turtle%E2%80%99s%20Back%20Slideshow.pptx?dl=0>



Jack Pine

**Service
Berry
(Saskatoon)**

Lupin

**Buffalo
Grass**

**Kentucky
bluegrass
(non-native)**

Root Depth measured in feet

Root Depth measured in feet

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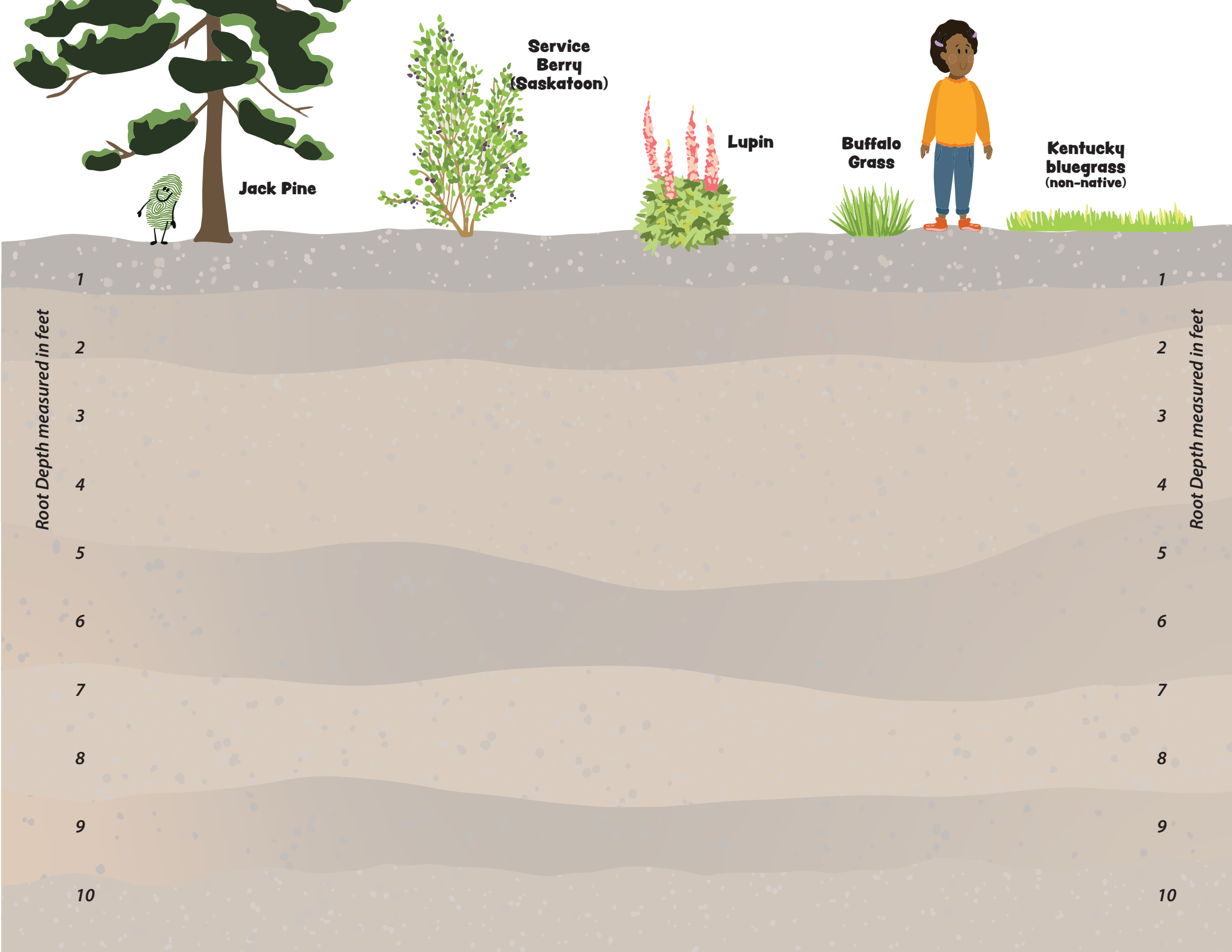
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Jack Pine



**Service Berry
(Saskatoon)**



Lupin



Buffalo Grass



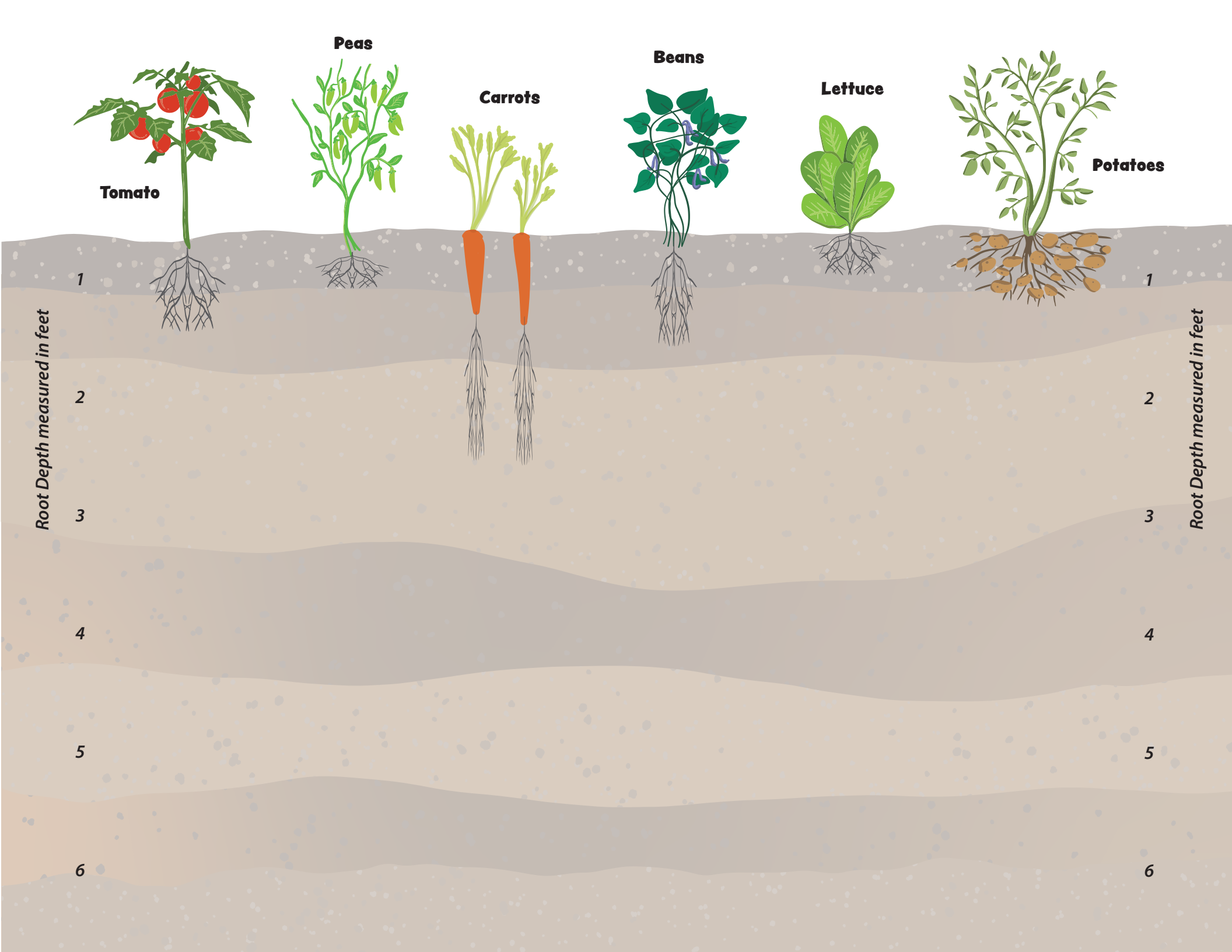
**Kentucky bluegrass
(non-native)**

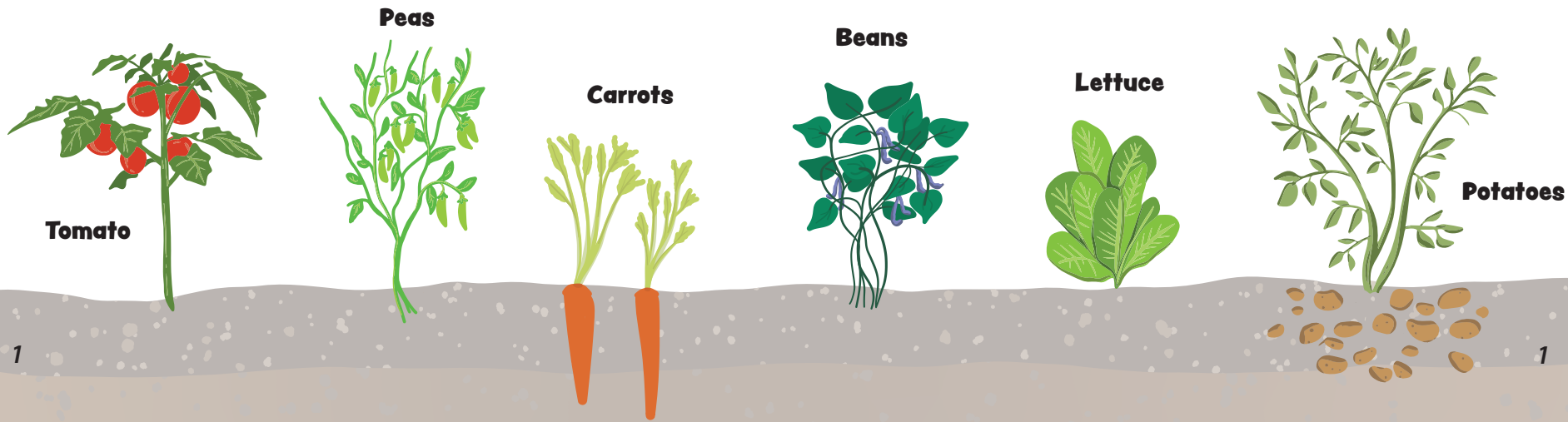
Root Depth measured in feet

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Root Depth measured in feet

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Root Depth measured in feet

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Root Depth measured in feet

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Lesson #7: What a Waste!

Preventing Food Waste as a Climate Solution

07

Big Idea



Food waste is a big deal in Canada, and an easy solution for many students to see and do. Connecting food waste as lost energy resources and new emissions helps us rediscover the important role food plays in our daily lives. Discover some ways to counter food waste by exploring how food is lost through production steps until it lands on your table. Then, create a class food waste pledge to prevent future waste on our end!



Suggested Steps:

1. Start by going through the slideshow.
2. Afterwards, do the first and then the second activity.
3. Close the lesson with a journal reflection prompt or My Climate Story handout.

Guiding Questions:

- How do my food choices impact the planet?
- What is lost when I throw away food?
- What can I do to prevent food waste?

Learning Objectives

I know (knowledge), I can (skills), I understand (conceptual understanding)



I KNOW

- ↳ That food waste means wasted energy and other resources.
- ↳ That my decisions on food waste matter and can help fight climate change.



I CAN

- ↳ Find solutions to reduce the food that I might waste.
- ↳ Collaborate to find good food waste solutions with family and friends.



I UNDERSTAND

- ↳ How food waste happens across production of the food I eat.
- ↳ That everyone can make a difference by being mindful of waste.

Lesson #7: What a Waste!

Activity 1: Farm to Fridge Food Roleplay

Time: 30 mins

Process: 10 steps

Materials Needed:

- Food Waste Roleplay cards
- Pen, pencil or marker to track remaining food
- Food Waste Station Explanations Guide
- Signs for Food Waste Stations to set up around the room
- Whiteboard and markers for review (Optional)

1. Ask your students to think about the different steps that food might go through to get from field to fridge.
2. Explain that today, you'll be looking at how food can get lost or wasted as it is getting produced.
3. Assign or hand out at random a different food item to each student, or have them work in pairs to go through each stage if you'd like. Explain to the students that you will imagine you are moving a large amount of that food item to eventually go to a grocery store and be bought by families.
4. As a class, you will walk through each station together and see how your food will be impacted. As you go through each station, more and more food will be lost or wasted.
5. Walk through each station with the students, beginning by reading out the description of the stage or step in production, as labelled or on a whiteboard.
6. Have your students discuss in their group what they think might happen to their food at that step, and then reveal the resulting food waste. Have your students take note of the food waste and subtract from their total beginning yield.
7. Continue going through each station following the steps above, where time allows, until you have completed the final stage. After the final station, have students review and tally how much food they have left and share with the class.
8. Discuss with your students what surprised them about this exercise. Were there any steps they thought seemed a bit funny?
9. As a further discussion, ask students to think about the energy and water required for each of their choices. Use a white board if you'd like and ask students to rank the food options in order of energy or water use guesses.
10. Close the exercise by asking the students to think about other factors that may make more or less food waste. How could transportation distance and the level of manufacturing of different food impact what is lost? How could their food buying choices help?

Lesson #7: What a Waste!

Activity 2: Food Waste Solutions Discussion & Pledge

Time: 30 mins

Process: 10 steps

Materials Needed:

- Food Waste Pledge Template

- Whiteboard and markers

1. Begin with a class discussion about what you have recently eaten, whether it was for breakfast, lunch, or a snack.
2. Write down some of the examples. Ask students to think about what some of the foods have in common? What plants or animals was it made of? How did it come to you? What kind of packaging?
3. After hearing some student responses, ask them to think about the impact of food waste. What would happen if you threw away one third of your food everyday? How much garbage would that equal? How much of our classroom garbage do you think is food waste or packaging? How much of it could be composted or recycled, if not already done so?
4. After thinking about the different foods your students eat, along with the previous activity, ask the students to think about how they can reduce food waste. What kinds of steps can you take together as a class? (e.g. use less plastic and packaging, find ways to use food in creative ways, or purchase irregular shaped fruits and vegetables. Write down the different actions of your brainstorm.
5. Explain to your class that you are going to work on a pledge together to cut down on food waste. Ask them to help define pledge if need be. Then, begin drafting your pledge together, or individually.
6. Use a piece of lined paper, or a pledge template. Have the students write down the pledge, and write a copy on easel board paper.
7. After reviewing the pledge with your students, have everyone in the class sign it, including the adults! Then, decide how you will help support each other to meet the goals of the pledge. What can be done when we work together?
7. As a further discussion, you may want to ask other classes to join with you, either down your hallway or next door.

Lesson #7: What a Waste!

My Climate Story Reflection



As part of planting seeds for climate stories, your students are developing their own story to help them walk through their role in climate change. You can use this assignment in place of -or to support- a journal reflection.

The worksheet for developing My Climate Story for this lesson asks your students to explore some more stories of young leaders taking action for the planet and for others. Learning more about others and hearing their great solutions will be inspiring for your students to create their own climate story at the end of the unit.

For further guidelines on helping your students develop their own Climate Story, check out the explanation in the Teacher's Guide (page #).

Reflection/Journal Prompts

- How can I help my family to not waste food at home?
- Draw the adventures of one food item from its beginning of life to your kitchen table.
- Imagine a meal that is healthy for you and the planet. What would be on your plate?



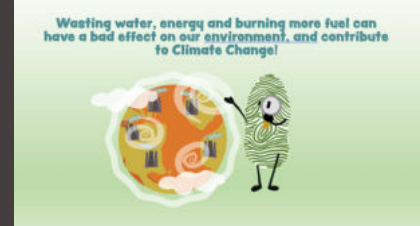
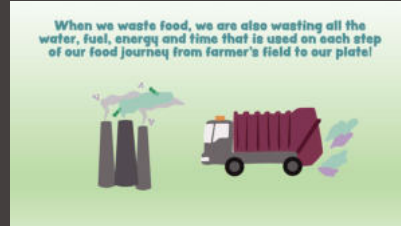
Extension Activities:

- ↳ You may want your students to also map out other energy that would get used in these processes: people labour to pick, grow, deliver the food, where it gets stored and how it moves around (vehicles, boat, etc. to emphasize even more.
- ↳ Vermicomposting is a great, interactive way for your students to see how food breaks down. Consider putting a vermicomposting bin in your classroom and have your students learn about the role worms and other bugs/insects have in breaking down organic matter.
- ↳ For an even further study, Try taking up a food waste audit with your class. -> gather food waste for a week and look at it. This also provides good numbers

Lesson #3: Presentation Outline

What a Waste! Powerpoint Presentation

07



This presentation reveals the huge amount of food that is wasted or lost throughout our system until it reaches a supermarket. Explore how the steps from field to harvest, manufacturing to transportation, and a grocery store to your fridge leaves roughly a third of food wasted or lost. This presentation reminds us that wasting food wastes the water and energy used to grow them, and asks students to reconsider waste at home and out, including spoiling food, rethinking best before dates, or buying misshapen or irregular fruits and vegetables. Together, we can make every harvest count!

Science Review

This video has a few science extensions that are worth noting and exploring further with some classrooms:

By the time a piece of food makes it to your refrigerator or pantry, it has taken up a great deal of energy and water. On average, Canadians waste an estimated one-third of food that they purchase.

While other people struggle with food insecurity, affluent citizens throw away a lot of food. To provide more context, if the greenhouse gases from worldwide food waste were added together, food waste would compete with the top top three carbon emitting countries for total emissions. .

A United Nations Report suggests that switching diets away from dairy and meat consumption is one of the largest actions we can take on climate change, with global agriculture accounting for almost 20% of worldwide greenhouse gas emissions, nearly 40% of total land use, and 70% of freshwater use.

You may have heard about the concept of Meatless Mondays, or taking up a 100-mile diet. Both of these actions can make a big difference on your food footprint, while supporting less emissions from transportation and waste through processing and consumption by animals, if done thoughtfully. Keep in mind the complexities of alternatives however - water and energy is lower in producing oats for oat milk than almonds, for example.

Our large scale efficiencies also have produced some interesting decisions. A recent study showed that greenhouse-grown lettuce in Canada was actually more resource-intensive than shipping up the same lettuce from the Southern United States. Global supply chains and growing plants in natural settings prime for their production may be the best alternative in some cases.

Regardless, it's the food that has made the trip all the way to you that matters. Ensure it isn't put to the garbage can by rethinking the perfect food you imagine. There really isn't any difference in taste if something is misshapen,

Teacher Background

Expand Your Worldview

and best before dates do not automatically mean a food is expired. We can be creative with food and find so many more uses for it before throwing it away or in a compost bin.

Indigenous Connections:

Indigenous communities have thrived across Canada by wisely using resources, including those of crops, hunted animals, and other plants foraged across the country. Bison were a key source of food for many Prairie First Nations, who used the entirety of the animal, and not only for eating.

Colonization has shifted ways of life for many Indigenous communities across Canada. A notable example is the Inuit, who in modern-day Canada still have trouble with astronomical food prices in remote and northern communities.

The community of Arviat in Nunavut along Hudson's Bay has addressed this food security by building a greenhouse. The venue helps families and local students to plant their own gardens and learn more about growing food with longer summers from climate change. Compost from the community's food waste is being used as a fertilizer, and the program connects youth to nutrition education, alongside a program for young hunters, promoting country food such as caribou and cod. All of this is proof that the most inventive ways to combat food waste start at school!

Stop & Check!

- Slide #1: Why is food so important to us?
- Slide #2: How does food travel to get to your plate?
- Slide #3: Can you think of ways that you waste food?
- Slide #4: What could you do to waste less food?



Sight Words to look out for:

- Wasted
- Harvested
- Storage
- Transportation
- Processing
- Pests
- Spoiled
- Expiration



A Walk On the Tundra
By Rebecca Hainnu & Anna Ziegler
Explore these three works exploring the land from different Indigenous perspectives.

A Day With Yahyah
By Julie Flett



Wild Berries
By Julie Flett

Activity 1: Farm to Fridge Food Roleplay

Our Foods Journey

Isn't it silly to use something once and then throw it away? What if we never used it all to begin with?

While other people struggle to find food today, we throw away a lot of food in North America. Each student will be assigned one food item, and you will walk from station to station in the room together. Have students think about what might happen at each step in their food's journey to their plate. Do the activity together as a class, or cut out and print the cards below. Ask students to guess what might happen to their food at that step before flipping over the card to reveal an answer.

Activity 2: Food Waste Pledge Template

Food Waste Pledge



We, the students of _____ ,
are committed to reducing food waste.

To help reduce food waste, we promise to:

By working together, we can
fight food waste!

Date:

Signatures:



A Dozen Apples Beginning



Apple Seeds

A Dozen Apples Field



Apple trees are grown in a large orchard. They take roughly 4-6 years to bear fruit. When ripe, the trees are checked and then the apples are picked at the right time for them to last all the way until they reach you.

But... some trees do not make it due to extreme weather and pests. Remove one apple from your total.

A Dozen Apples Processing



Apples are harvested from trees and washed. Cameras inspect their size, colour, and for any bruises. A new coating is put on them to help protect them and give them a longer shelf life.

However... Not all apples are 'perfect' for store sale. Some are sent for processing for juices, etc. Remove two apples from your total.

A Dozen Apples Transportation



Next, the apples are Stored in a room with lower oxygen to keep them from ripening too quickly, until they are shipped to grocery warehouses or individual stores.

But... Some apples still ripen too quickly. Lose one apple from your total.

A Dozen Apples Grocery Store



Put out in the store, apples ripen quicker at room temperature and with regular oxygen levels. After being displayed in the store, the apples are handled by people looking for the best shape and firmness.

The result? Some apples are dropped and bruised, and others become mushy when next to other apples. Lose one apple.

A Dozen Apples Consumer



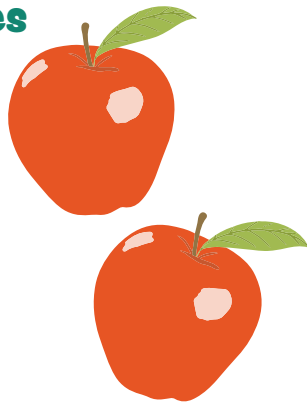
Apples sit in a fruit bowl or fridge, where they give off ethylene gas that also ripens other fruits around them.

Some apples are eaten in time and others over ripen.

One apple is bruised from transporting it to your home. Another is forgotten in your lunchbox over the weekend.

Lose two two apples.

A Dozen Apples End Result



A few apples.

A Full Cow Beginning

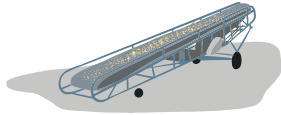
Cow begins as a young calf

A Full Cow Field



The cow grows up in open pastures or in a feedlot. It eats hay and other plant crops, drinks water, and grows to roughly 3 years old until slaughtered.

A Full Cow Processing



Goes to a processing plant and is butchered. Then it is frozen and stored cold.

A Full Cow Transportation



Meat is transported in a refrigerated truck to a store distribution point or warehouse.

A Full Cow Grocery Store



Meat is sold in packaging and cut at a certain temperature

A Full Cow Consumer



A Full Cow End Result



Kilogram of steak

Pail of Lentils Beginning



Lentil Seeds

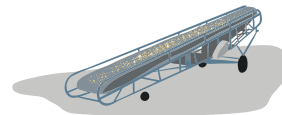
Pail of Lentils Field



Grown on a field without irrigation, lentils do not require a lot of water. After months of growing, they are sorted using a harvesting combiner.

But... some of the lentils are lost in this process. Remove a cup of lentils.

Pail of Lentils Processing



Lentils are dried out and then stored until processed in bags.

Pail of Lentils Transportation



Lentils are shipped to food distribution centres.

Pail of Lentils Grocery Store



Some of the bags of lentil seeds have a hole in them, and are thrown away.

Pail of Lentils Consumer



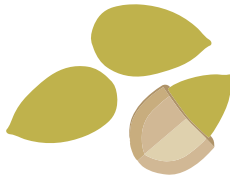
Keeps

Pail of Lentils End Result



Cup of lentils.

Loaf of Bread Beginning



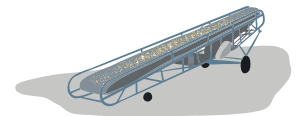
Wheat Seeds

Loaf of Bread Field



Wheat takes roughly 4 months to be ready to harvest if planted in the spring, and 8 months if planted in the fall.

Loaf of Bread Processing



The grains of wheat are harvested and crushed into flour at a mill which is then stored.

Loaf of Bread Transportation



Flour is transported by truck to a bakery inside a grocery store or bakery.

Loaf of Bread Grocery Store



The bakery uses the flour along with other ingredients to make bread. Bread past its expiry date of a few days is reduced for a day, and then thrown away.

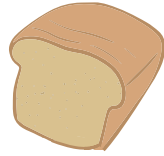
Loaf of Bread Consumer



A loaf of bread is taken home, and some of it is eaten. But half of it is left on the counter, becomes dried out, and is tossed in the garbage.

A Loaf of Bread End Result

Half a loaf of bread



2 Litres of Orange Juice Beginning

Orange Seeds are planted, or a piece of an orange tree is grafted on to another rootstock.



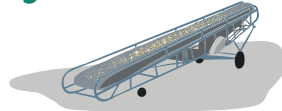
2 Litres of Orange Juice Field

Orange trees grow and bear fruit after 3 years if from a rootstock, or 15 by seed. Some of which bear good fruit, others misshapen. Hundreds of oranges grow per tree.



2 Litres of Orange Juice Processing

Oranges are harvested by hand into nylon sacks and transported to a packing house. Water and gases are added to the fruit to keep them fresh and kill any funguses.



2 Litres of Orange Juice Transportation

Oranges are moved from the packing house to stores and warehouses. The ones that are bruised, miscoloured, or under/overripe are sent off to a juice plant to be pressed into orange juice.



2 Litres of Orange Juice Grocery Store

Orange juice arrives at the store, and cartons are dented.



2 Litres of Orange Juice Consumer

Orange juice needs to be consumed in 7-10 days after opening.



2 Litres of Orange End Result

A litre of orange juice.



A Litre of Maple Syrup Beginning

A Maple seed is planted and germinates



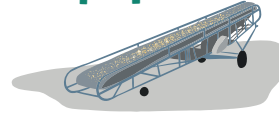
A Litre of Maple Syrup Field

The maple seed germinates and grows for many years. It needs to be at least 40 years old to tap.



A Litre of Maple Syrup Processing

Gallons of maple sap are tapped from the trees before the buds on the trees grow. For every forty litres of concentrated maple water, the water is boiled down to one litre of syrup.



A Litre of Maple Syrup Transportation

Maple syrup is stored in large barrels and stored in a central warehouse. The quality, colour and content is inspected and a "grade" is assigned to types.



A Litre of Maple Syrup Grocery Store

Maple syrup cans or bottles that are damaged along the way have to be thrown away.



A Litre of Maple Syrup Consumer

Bottle or can of syrup is used as a sugar alternative in baking and pancakes.



A Litre of Maple Syrup End Result

Bottle of maple syrup



Three Heads of Lettuce Beginning

Lettuce Seeds



Three Heads of Lettuce Field

Grown in a greenhouse setting or in the Southern United States or Mexico. Faster varieties can take as little as 30-45 days. Water and nutrients are added to support it.



Three Heads of Lettuce Processing

Heads of lettuce without pests or wilted leaves are packaged for transport. The lettuce heads are cut and packaged in plastic immediately, and put in a storehouse to cool.



Three Heads of Lettuce Transportation



Transported by refrigerator truck and then stored in a cool warehouse.

Three Heads of Lettuce Grocery Store



Lettuce is set out at the store in a cool place. However some heads begin to quickly rot in the store and are thrown away.

Three Heads of Lettuce Consumer

Lettuce lasts a week to ten days in your refrigerator.



Three Heads of Lettuce End Result

One head of lettuce



Lesson #8: Solutions Make Us Stronger

Enacting on a Climate-Friendly Project

08

Big Idea



You can make a difference for the climate and the plants around you. Determine together an action you can take that will keep plants and the planet healthy. Climate change solutions do not have to be complex: plant a seed of climate action through protecting the living world around you.

Suggested Steps:

1. Start with a class discussion and brainstorming session.
2. Decide on a climate-friendly project you'd like to explore together.
3. Make a difference in the world and celebrate its completion!

Guiding Questions:

- What is being done around the world to adapt to climate change?
- How can I fight climate change in my day-to-day actions?
- How can I inspire others to make a difference to help the planet?

Learning Objectives

I know (knowledge), I can (skills), I understand (conceptual understanding)



I KNOW

- ↳ That I am not alone in learning and action on climate change.
- ↳ How to work through my emotions on climate change and find solutions.



I CAN

- ↳ Identify climate-friendly actions we can do at school, at home, and in the community.
- ↳ Listen to other people to find solutions and inspiration to fight climate change.



I UNDERSTAND

- ↳ That I can make a difference through my own actions.
- ↳ That everyone needs to work together to fight climate change.

Lesson #8: Solutions Make Us Stronger!

Activity 2: Protecting Plants, Planet & People

Time: 30 mins

Process: 11 steps

Materials Needed:

- Plants & Climate Change Solutions List
- Spheres of influence diagram (on a smartboard)
- Post-its for voting (optional)
- Whiteboard & Makers
- Materials for action project (optional)

1. Begin the activity by reviewing what they have learned about plants and climate change. Ask your students what are some key takeaways. Do they remember the five key things about climate change (the Climate High Five)?
2. Ask students what kinds of actions they could take to support plants and the planet at home, school, and in their community. Use the Spheres of Influence diagram and go over some actions, step by step.
3. If students have trouble brainstorming solutions, use the pre-populated diagram with suggestions already provided, and some space in case your students can think of more solutions to add.
4. Ask your students to then think about which of these solutions you can take together as a class. Guide this discussion with what is feasible for your own timeframe, and resources.
5. From there, determine a best way to vote on the project you'd like to do together. Remind students that all of the projects would be helpful, but you'll want to stick to just one in class so you can make the best impact. Encourage your students to try doing some of them at home, or in other places within their community.
6. If voting using Post-Its, give each student three of them, and instruct them to draw a heart on one, a checkmark on another, and a smiley face on the last one.
7. List the different chosen solutions for voting on the whiteboard with plenty of space, or around the room.
8. Explain to your students that the heart Post-It should be put next to the solution they loved the most, even if they think we may not be able to do it at school. The second Post-It with the checkmark should go on the activity they think would have the largest impact, even if it may be too challenging to do in class. Finally, the smiley face Post It should go on the activity they'd like to do together in class.
9. Once voting is complete, tally the totals and go over the top activities your students loved, and assess and discuss the actions that would have the most impact, if there is time.
10. Remind your students that we can always take more than one action at once in our life, but you'll need to focus on one solution together.
11. Decide on a timeline and what roles each student will take for your chosen action project. Consider how to get all students involved and how you can celebrate its completion and inform others in your school community on the actions you are taking together!

Lesson #8: Solutions Make Us Stronger

My Climate Story Reflection



08

As part of planting seeds for climate stories, your students are developing their own story to help them walk through their role in climate change. You can use this assignment in place of -or to support- a journal reflection.

The worksheet for developing My Climate Story for this lesson asks your students to explore some more stories of young leaders taking action for the planet and for others. Learning more about others and hearing their great solutions will be inspiring for your students to create their own climate story at the end of the unit.

For further guidelines on helping your students develop their own Climate Story, check out the explanation in the Teacher's Guide (page #).

Reflection/Journal Prompts

- How did you feel when thinking about climate solutions? Why do you think that was?
- Who are some other climate heroes around you?
- What are some climate-friendly actions I can take at home?



Assessment/Evaluation

The Climate Storytelling activity will require formative and summative assessment, with feedback given on the draft, and questions the student asked the featured person, where possible. For the climate solution activity, summative evaluation in the form of an exit slip or self-evaluation would help check for understanding and engagement with the activity and larger concepts.

Extension Activities:

- ↳ You may want your students to create a series of climate storytelling profiles of people in the school, community, or more abroad. This assignment would be great to film snippets of the person's replies, and showcase all together as a mini exhibition or on a posterboard in the hallway.
- ↳ You may wish to modify the climate-friendly activity for younger classes by starting with a brainstorm of climate actions and then having a pre-developed list of activities, asking the students to vote on which one to do instead.

Lesson #8: Take Action

Climate Storytellers

08

Science Review

You may have heard before about carrying capacity, or the amount of a species that can be held in their own place comfortably. If everyone in the world lived like we did in the Global North, we would need 3 Earths to sustain our lifestyle and carbon footprint.

Canada's role in global emissions may be small in terms of our small population, but per capita we are one of the world's biggest emitters, mostly caused by our heavy fossil fuel and resource extraction industries, and our huge consumption in energy in other ways, including transportation and heating across long distances.

The Drawdown is an initiative that outlines the most impactful changes our society can make to cut down greenhouse gas emissions. Amidst a number of industry actions is some highly impactful plant-based solutions. While some may require us supporting causes elsewhere (tropical forest restoration), others can begin close to home, including reducing food waste and taking up a plant-based diet.

For personal impact, a recent study by UBC includes a plant-based diet along with some other high-impact actions that are often made by adults. This includes flying less, going car-free, and having smaller families. The study

argues having less children means reducing a person's entire lifetime carbon footprint, and those of their future offspring.

While some of the actions our society will need to take to reduce our global emissions are complex, there are solutions all around us. Some are big and some are small, but the largest impacts we can make are collective. All of these are entry points for conversations you can have with your students, provided they are done thoughtfully and without judgement.

Indigenous Connections:

Indigenous communities across Canada are well-aware of the effects of climate change. They also are leading the way in looking for solutions to the challenges we have today. To help explore some of these solutions, the Montreal Science Centre created a bilingual game for youth called Climate Tactics. Students will help save Bear by playing different cards to reduce greenhouse gases, and each card highlights a different action carried out by an Indigenous community.

Indigenous Youth Climate Action is an organization led by Indigenous people to advocate for climate justice for Indigenous communities across Canada. They also help highlight the often unrecognized work of these communities in their own sustainability actions.

Activity 2: Plant & Soil Climate Solutions

There are lots of plant and climate-friendly solutions. How can you help protect plants and the planet?

Read each of the plant-friendly solutions on the list below and put a checkmark next to the impacts that solution has.

Solution:	Protects plant habitats	Cuts down on waste	Helps plants store carbon & produce oxygen	Connects my community	Teaches someone else
Plant a community garden					
Volunteer at a garden					
Start a compost bin!					
Store food well					
Talk to friends and family about how plants help us					
Invite a guest speaker to explore plants with you!					
Remove invasive plants that are weeds					
Learn about a native plant and protect it					
Arts campaign celebrating native plants					
Cover bare soil in your area with plants!					
Check up on plants around you					
Make recipes featuring a mystery plant					