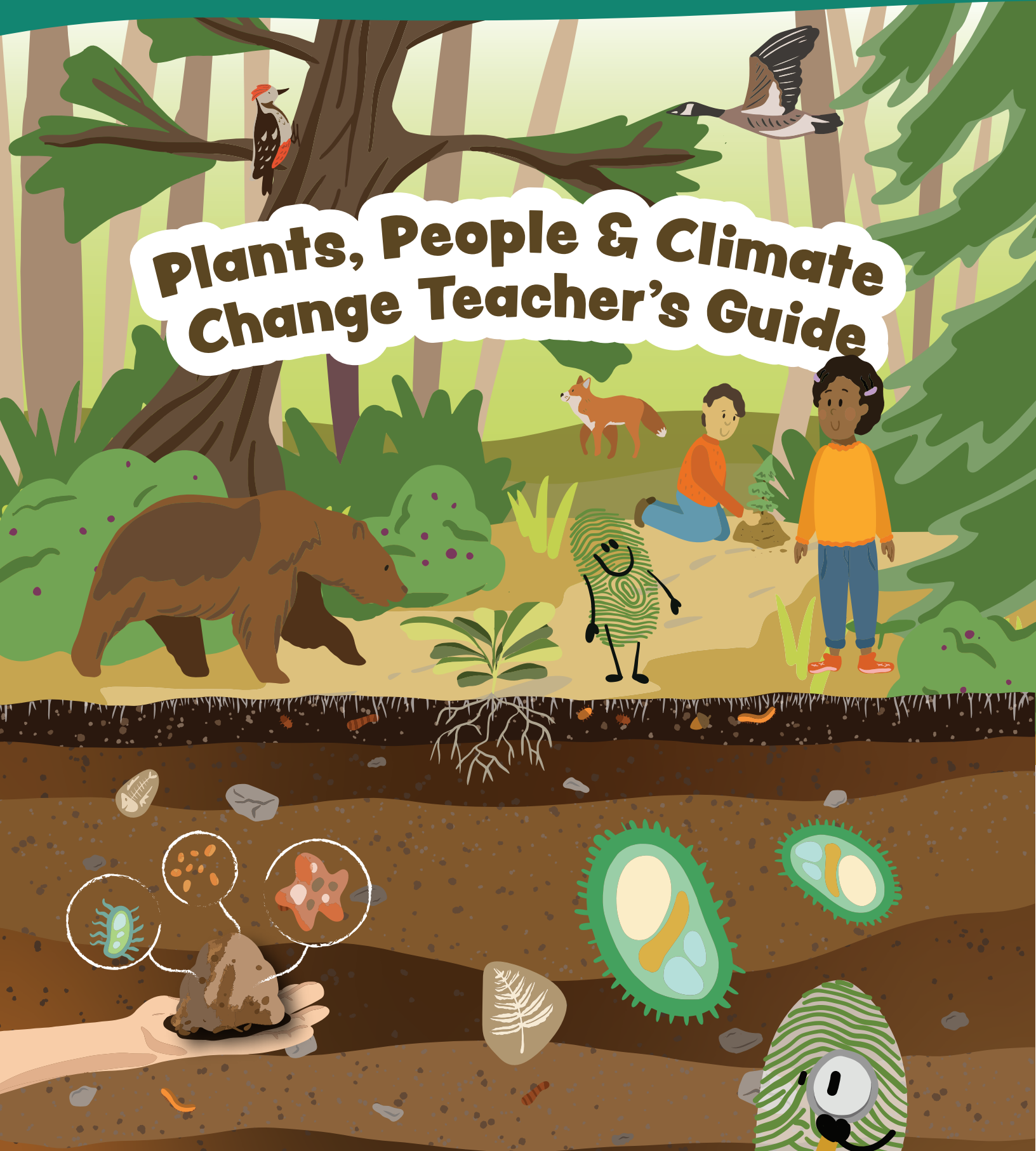


# 8 Lessons & Activities for Grades 3 and Up



Little  
GreenThumbs

## Plants, People & Climate Change Teacher's Guide



# Sections of the Guide:



## Table of Contents

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<b>Overview of the Guide</b> . . . . .	<b>1</b>
<b>Resource Overview</b> . . . . .	<b>2</b>
<b>How to Use This Resource</b> . . . . .	<b>4</b>
<b>Building Your Knowledge of Climate Change</b> . . . . .	<b>13</b>
<b>Getting Started</b> . . . . .	<b>19</b>
<b>Appendix: Glossary</b> . . . . .	<b>20</b>
<b>Appendix: Resources</b> . . . . .	<b>22</b>

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# Overview of the Guide

Welcome to a journey of climate change education through the world of plants! The goal of the Plants, People and Climate Change resource is to provide teachers with easy-to-use resources for teaching about climate change using climate story telling and the lens of the natural world.

This Teacher's Guide will provide an overview of the Plants, People and Planet resource and how it can be used in your classroom. Our hope is that it will provide confidence, inspiration and information needed to inspire the delivery of climate change education and help educate a climate literate generation!

## Do I Need a Garden to Use This Resource?

You don't need a garden to do this resource effectively, but access to a garden can certainly help! In each lesson, you will find an activity that does not rely on access to an outdoor garden - and many of them can even be facilitated during the winter months if needed!



## What Is This Resource?

Plants, People and Climate Change is an 8-lesson resource with accompanying videos, activities and students hand-outs to help students explore climate change through the world of plants! The resource is accompanied by a supplementary guide - My Climate Story - that helps students reflect on the personal meaning of what they learn, while considering their own lives, what matters to them and their health.

## Who Is This Resource For?

The resource has been designed for students in Grades 3-6, but elements of it could be used for older students.

## Where Do I Access It?

The entire set of videos, activities, and student hand-outs is available free to download at [www.littlegreenthumbs.org/cc](http://www.littlegreenthumbs.org/cc).

## When Should I Use This Resource?

You can plan to use this resource any time of the year! It will always be helpful to have some living plants around that you can observe, but it's not essential. The best time is spring, fall or summer, but you can facilitate this resource even in the winter!

## Why Is This Important?

Even our youngest students are exposed to a lot of information about climate change today. Much of this can be difficult to process, and some of it can be contradictory or even wrong. These informational environments can lead to anxiety, apathy or even paralysis for action. By offering an exploration of climate change through a plant perspective, students will gain understanding of climate change causes, impacts and solutions in a tangible way. They will build a science foundation for understanding climate change, and personally reflect on what is important to them in their lives. Through this experience, our hope is to build students' knowledge, confidence and a sense of power and agency.

Throughout this resource you will find opportunities to weave Indigenous ways of knowing and understanding, which is an important aspect of earth-based and climate change education. You will find inspiration throughout the lesson plans for this aim.

## Plants Show Us Change

Even in locations with limited biodiversity, we find plants around us. Plants an integral part of most landscapes, and signal the changes of weather, climate and seasons! From trees moving in the wind, to ice crystals forming along branches or the earliest crocus blooms, plants are messengers about our dynamic world and invite connection through observation.



# Resource Overview

Plants, People & Climate Change is a resource for Grade 3-6 classrooms to explore topics of plants, soil health, and habitats while reflecting modern concerns of climate change. There are 8 lessons in total, each with the following sections:



1

Lesson Overview with big idea & discussion questions



2

An animated video or Powerpoint Presentation



3

Two interactive activities or exercises



4

My Climate Story discussion, reflection or activities



5

Ideas for further learning & assessment

## Not doing a unit on plants but still interested in teaching about Climate Change?

Consider using *My Climate Story* on it's own. The inclusion of *My Climate Story* in the Plants, People and Planet resource is also optional.



Renee Lertzman, George Marshall, and the Climate Psychology Alliance.

This resource was created in partnership with Eco-Anxious Stories, an organization channeling eco-anxiety into meaningful climate action. Learn more about them at [www.eco-anxious.ca](http://www.eco-anxious.ca).



## My Climate Story

*My Climate Story* is a companion set of activities to explore climate change. The linked activities and discussions focus on personal feelings and issues of identity surrounding climate change. *My Climate Story* helps to frame climate change and related anxieties in an age-appropriate way, and these resources and activities are meant as a complementing support for educators.

This resource uses a storytelling approach inspired by Marshall Ganz's work on public narrative, and it is based on recommendations and research from leading climate psychologists and communicators. This includes Caroline Hickman, Leslie Davenport,

## My Climate Story Includes:

- A Teacher/Parent Reflection Guide
- A Teacher Guide with Activities
- Student Hand-outs

## For Older Learners too!

Many of these resources can be adapted for a high school geography, natural or environmental science course. Share the videos and activities with a colleague who may find it helpful!



# Resource Overview

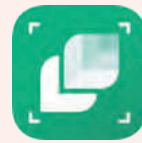
## Why Use Plants to Teach Climate Change?

The world of plants provides a tangible path to explore the causes, impacts and solutions of climate change. Understanding the important roles that plants have on our planet, as well as how plants meet their needs and have adapted to live in their habitats and environments, can help students better understand the consequences of a changing climate and what this means for the health of plants and our planet.

Plants provide so many of the life-supporting properties on the planet. This includes carbon sinks and storage, purifying the air, and providing natural resources for us to survive. Plants, soil and the natural environment also hold many of the solutions for climate change. The life-supporting properties of the planet are truly built around water, plants and forests and engaging with the natural world provides endless engaging opportunities for discovery and learning.

Plants and habitat exploration are a natural fit for early to mid-elementary science classes. As you explore habitats and the building blocks of plant needs and photosynthesis, tie into weather and climate concepts by introducing climate change in a natural and intentional way.

Our favourite plants, people and climate change apps are below, all free of charge. The entire world is at your fingertips!



### Leafsnap

A photo of a plant's flowers, barks, leaves, or fruit will help you identify it instantly using this app.

<https://cwf-fcf.org/en/resources/downloads/mobile/leafsnap.html>



### Florish

this plant care app will help you spot any health problems, and uses your phone's camera to determine if your plant is getting enough light. <https://apps.apple.com/us/app/florish-plant-care-companion/id1305012203>



### iNaturalist

Identify nearly any living thing by taking a photo of it. Vetted by scientists with 85% accuracy of the first suggestion. <https://inaturalist.ca/>



### Earth Now

an app from NASA, you'll be able to explore a virtual globe and explore satellite data on the planet's vital signs. <https://www.nasa.gov/stem-ed-resources/Earth-Now-App.html>

# How To Use This Resource

Plants, People and Climate Change has been designed to provide teachers with hands-on activities.

## How to Navigate the Resource

There are several routes you might take to navigate this resource in your classroom.



Who else at your school might find value in this resource? Share it with your colleagues!



# How To Use This Resource

## Lesson Arc

The series of lesson plans follow this arc of foundational plants and climate change knowledge. They are grouped under the following concepts:



### Lessons 1-3

#### Planting Seeds of Science Knowledge & Understanding

Lessons 1-3 provides foundational knowledge about the **important roles that plants fulfill in our environment and habitats**, what plants need to be healthy and how plants can survive across the globe in different environments. These concepts provide an important foundation for understanding climate change through the lens of plants and the natural world. These three lessons could be used independently in any situation and are versatile and provide a foundation overview of plants, and do not introduce climate change just yet.



### Lessons 4-5

#### Introducing the Problem of Climate Change

We first introduce the concept of climate change in lessons 4 and 5, all while connecting to a common thread of plants and building. This begins with an **overview of climate change, greenhouse gases, the greenhouse effect in the atmosphere, weather vs. climate, and photosynthesis**. Then, specific impacts of climate change on plant health and adaptation are explored, using plants as the entry point to the impact of climate change on broader habitats.



### Lessons 6-7

#### Solutions to Climate Change

After an introduction to Climate Change, we move quickly to proven climate change solutions. This section delves deep into the **role of soil in serving as a vital carbon sink** and the microorganisms below. Then, we explore the **processes of our food systems** to show how **food waste** can prevent wasted energy and resources. The solutions are based on these two tangible actions that students can easily understand and act upon.



### Lesson 8

#### Personal Action for Climate Change

Now that students have built a foundation of understanding the connection between plants, people, and climate change, they're ready to think of some more **climate solutions**. In the final lesson, students will take up a larger action project they can do to take a personal **climate action** in their community.

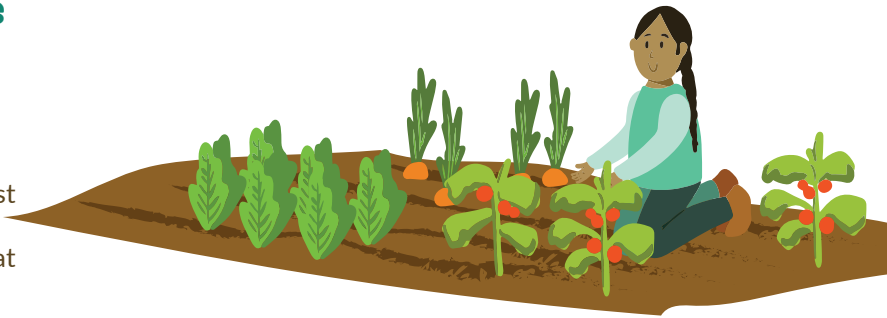
# How To Use This Resource

## Incorporating First Nations, Métis & Inuit Understandings

A conversation on plants and the environment cannot take place without an acknowledgement of the immense values and worldviews of Canada's First Nations, Métis & Inuit communities. As a national resource, we have gathered diverse perspectives that share a common emphasis on the importance of the land. We encourage you to localize this resource to your community in a meaningful way with local Indigenous knowledges.

We have woven some supports into the lesson plans that will help you to explore different traditional knowledge and perspectives, and inspire you to connect to local Elders, Knowledge Keepers, or Indigenous school board liaisons. Making these connections will help your students -and yourself- better understand the sacred role that many plants play in Indigenous medicines, ceremony, and cultural practices.

In the resource, you will find some short pieces outlining some Indigenous connections to the overall theme of the lesson.



In the lesson plans, we've featured some age-appropriate children's literature that features young people making sense of the land with their family and community.



## Looking for Multi-disciplinary inspiration?

Here are some approaches you can take using recommended activities from the resource:

### Geography:

Discover different plants across Canada's diverse habitats by exploring adaptations in Lesson #3.

### Health:

Take up the *My Climate Story* activities to support mental health and anxiety around climate change.

### Art:

Examine a painting by renowned Métis artist Christi Belcourt and learn about pointillism and plants in Lesson #5.

### Drama:

Create a dramatic plant with particular needs in Lesson #3.

### Math:

Graph the temperature change in our greenhouse effect activity in Lesson #4.

# Overview of All 8 Lessons



## Lesson 1: Plants, Planet & People

Start by exploring the interdependence of plants, animals, and the important roles plants have for life on earth. As humans, we rely on plants in many ways - for food, shelter, clothing and even the air we breathe - and the health of our planet relies on plants too.

- **Activity 1: Plants Around Us**

Chart the plants you interact with -and rely on- throughout your daily activities.

- **Activity 2: Relationship Webs**

Build a relationship/interdependence web together of living and nonliving things in the boreal forest.

**My Climate Story activity:** students consider the key characters and important settings in their lives.



## Lesson 2: Plant Needs

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

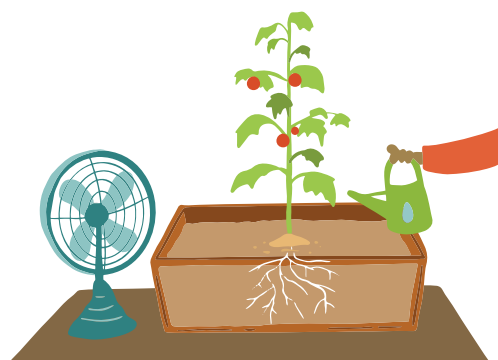
- **Activity 1: Plant Needs & Human Needs**

Use a Venn diagram to compare human needs with plant needs.

- **Activity 2: Plant Doctor**

Become a plant doctor and chart the health of a plant around you.

**My Climate Story activity:** Just like plants, humans need a special habitat to thrive. Students map out the important things about our home environments needed to be healthy.



# Overview of All 8 Lessons



## Lesson 3: Plant Adaptations

Plants thrive in nearly every habitat in the world! Students explore how different plants are able to meet their needs (LAWNS) in very diverse environments. Plants have distinct features, called adaptations, that allow them to survive - such as long roots on desert plants that help them to find water far below the surface or big leaves on rainforest plants that help to gather sunlight in shady areas.

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

"I'm going on an adventure" discussion exploring different needs in different ecosystems and environments.

- **Activity 2: Ready, Set, Grow! Roleplay**

Plant drama roleplay creating a plant with particular adaptations and needs.

**My Climate Story activity:** guides students to reflect on the roles and relationships in our lives and how we have power to influence change in those relationships.



## Lesson 4: Plants, People & Climate Change

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.

- **Activity 1: Greenhouse Effect Experiment**

Use a covered plant tray to understand the greenhouse effect in a mini science experiment.

- **Activity 2: Discussing Our Feelings About Climate Change**

Have a class discussion on your students' feelings around climate change.

**My Climate Story activity:** uses a high five example to explore five important things kids should know about climate change.



# Overview of All 8 Lessons



## Lesson 5: Plant Needs & Climate Change

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.

- **Activity 1: Plant Needs Experiment**

See the impact of changing conditions for plants by adjusting plant needs in a science experiment.

- **Activity 2: If I Held The Shovel**

Analyze a painting by Métis artist Christi Belcourt to explore the power of supporting plant and plant ecosystems.

**My Climate Story activity:** reflect on the deep emotions of climate change and environmental challenges to find ways to support your students' climate story.



## Lesson 6: Soil & Climate Change

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!

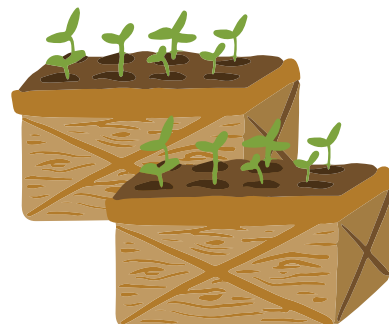
- **Activity 1: Bombs Away (Making Seed Bombs)**

Make seed bombs to explore the parts of soil and the role of native plants in preventing erosion.

- **Activity 2: How Low Do Roots Go?**

Guess the root depths of various native plants and garden vegetables to discover the role of roots.

**My Climate Story activity:** Learn about some plant and climate superheroes to inspire your students' own climate story.



# Overview of All 8 Lessons



## Lesson 7: Food Waste & Climate Change

Food waste is a big deal in Canada, and an easy solution for many students to take part in. 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!

- **Activity 1: Farm to Fridge Food Roleplay**

Learn about food waste along the production line from a number of common food products.

- **Activity 2: Food Waste Pledge**

Craft a classroom food waste pledge to explore ways to reduce food and food packaging in your school.

**My Climate Story activity:** Explore some more climate storytellers to inspire your students' own stories.



## Lesson 8: Climate Storytelling

You can make a difference for the climate and the plants around you. As a class, decide on 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.

- **Activity 1: Building My Climate Story**

Take up the *My Climate Story* activity outlined below.

- **Activity 2: Protecting Plants, Planet & People**

Explore the impact of different plant and climate-friendly actions and solutions. Then choose one to enact individually or as a class.

**My Climate Story activity:** The culminating task is to help your students draft their own *My Climate Story*, featuring their own story of empowerment and agency to help protect people and plants during climate change.



# Lessons at a Glance



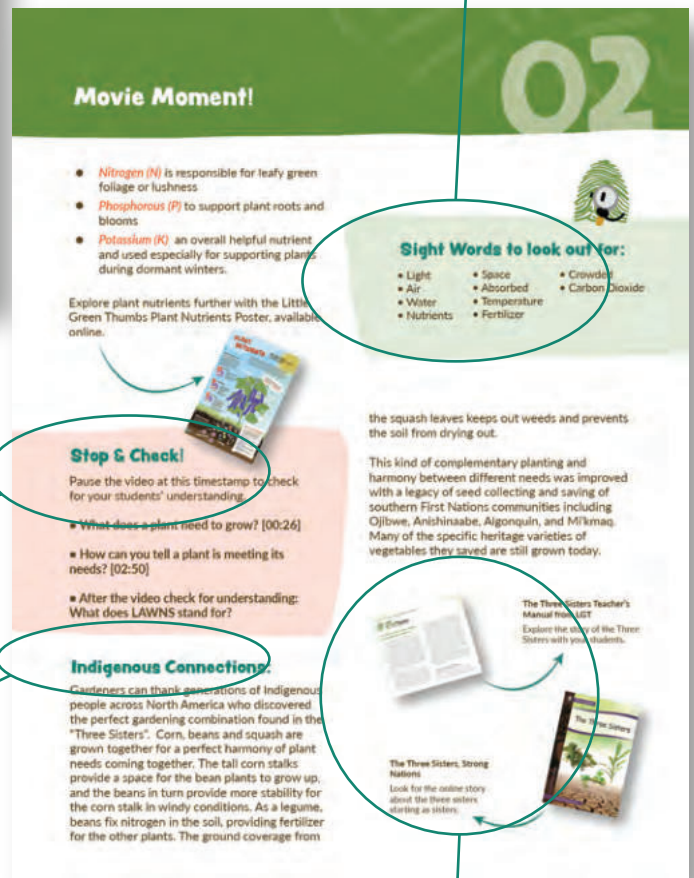
**A brief science review:** with extra information to build your own science foundation

**Suggested stop points:** throughout the video to pause and check for understanding

**Indigenous connections:** help you to see another worldview connected to First Nations, Métis, and Inuit peoples.

**Outline of a video:** to support the lesson, and a summary of the film

**Useful sight words:** to explore with young learners



**A great children's book** that connects to First Nations, Métis or Inuit perspectives on the land and plants.

# Lessons at a Glance

**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	I CAN	I UNDERSTAND
<ul style="list-style-type: none"> <li>Most plants have the same basic five needs (represented by LAWNS).</li> <li>Plant needs vary depending on the plant.</li> </ul>	<ul style="list-style-type: none"> <li>Compare and contrast the needs of plants to the needs of other living things, like humans.</li> <li>Identify when needs of plants are not being met and how I can help them.</li> </ul>	<ul style="list-style-type: none"> <li>How the needs of plants can differ based on habitat or ecosystem.</li> <li>My role in supporting plant needs when they are not met by nature.</li> </ul>

**Suggested steps:** If you want to do the entire lesson and the video, this is a suggested run of the show

**Reflection prompts:** can be used for journals or discussions

**Some extension & accommodation suggestions:** to keep the conversation going, or for a deeper discussion.

**My Climate Story:** An overview of the complementary resource for activities connecting climate science to emotions.

**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 2).

**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, 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!

# Building Your Knowledge Of Climate Change

## What is Climate Change?

Climate change is the changes of average weather conditions (such as temperature, precipitation, etc.) over a prolonged period of time.

Climate change is a complex problem, and it can be difficult to make sense of the science, impacts and solutions. To help you better understand the cause and impact of climate change, we've assembled key facts, important concepts and a list of resources below.

Please also refer to the science section found in each lesson plan for a more in depth exploration of particular topics.

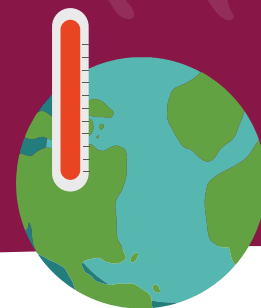
## Thinking Beyond Your Bubble

Building a sustainable world requires a systems thinking perspective. One way of looking at sustainable development is to imagine three nesting rings of sustainability. **The outer ring (Environmental Preservation)** is a healthy environment that supports our livelihoods and provides services such as oxygen, pollination, and healthy ecosystems we rely on. **The middle ring (Social Equity)** is our society, which requires sustainable cultural practices and ways of living. Finally, as creators of the economy, we can build **Economic Equity** that supports equity for people and the planet.

### Environmental Preservation



# 5 Things to Know About Climate Change



## 1. It's Real

There's nothing to debate; climate change is a reality. While you may hear stories about climate skeptics questioning human-caused (anthropogenic) climate change, the vast majority of peer-reviewed science (97% of published articles)\* points to human actions as the main cause of our current climate crisis.

How bad is it? Since industrialization, the average global temperature has increased over 1 degree Celsius. Most of our climate imbalance comes from increased greenhouse gas (GHGs) emissions into the atmosphere. The majority of this is carbon dioxide (CO<sub>2</sub>), but methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) are also major emissions, with methane 25 times more potent than carbon dioxide. We use carbon dioxide as the baseline, so sometimes you will see the abbreviation CO<sub>2</sub>e as a standard unit of carbon dioxide equivalent.

**350**

the maximum safe amount of carbon dioxide equivalent (CO<sub>2</sub>e) in parts per million in the atmosphere to prevent irreversible global warming.

**2050**

the world's goal to achieve net-zero emissions.

**417.7**

the average amount of CO<sub>2</sub>e in parts per million in 2020.

**1.5**

the number of Earths required to sustain the planet's peoples right now.

**4.3**

the number of Earths required if everyone on the world lived as we do in Canada.



## 2. It's Impacting Humans, animals & plants

Climate change is affecting and transforming global ecosystems, even if it may be difficult to always see its effects near you. Yet across the world, people are already suffering the consequences of climate change. Around 22.5 million people were displaced by climate or weather-related disasters between 2008 and 2015, according to the UN Refugee Agency (UNHCR). More and more countries around the world are experiencing record high temperatures, droughts, unprecedented floods and other extreme weather events. While we can't necessarily attribute climate change as the root cause of many extreme weather events, the frequency and severity of extreme storms is often climate-connected.

The long-term impacts of climate change will have serious consequences for much of the world's population. Beyond sea level rising with polar ice caps melting, water and food security is a huge issue. When seasons abnormally adjust with changes to precipitation and heat, we will see regions impacted by more heatwaves, milder winters, and other unpredictable weather. Climate change may not mean your region will always be warmer. In fact, some parts may cool while others warm, as weather patterns shift between areas.

Food security will become an even bigger concern in future because some crops and livestock, and fisheries won't survive in parts of the world if conditions become too hot and dry, or cold and wet.

Many animals and plants are unable to adapt as quickly as humans. A warmer climate impedes regular growing cycles and the ability for many animals to live 'normally' where they have always been. Migrating birds may return and the season has already started. Frogs and amphibians are at an increased risk as wetlands dry and diseases have increased from warmer waters. It's no wonder then that climate change is seen as the greatest threat facing humanity.

# 5 Things to Know About Climate Change

## 3. We must limit global temperature rise to 2 degrees celsius – and we can!

With modern technology and data, we can measure of the amount of GHGs in the atmosphere in many ways. We can track global weather patterns with satellites and instruments, and use sources such as glacial and polar ice cores to see the amount of carbon in the atmosphere millions of years ago.

The Intergovernmental Panel on Climate Change (the IPCC) outlines that our current activities have caused around 1 degree of warming above pre-industrial levels. Without a rapid shift to curb emissions, we could reach 1.5 degrees of warming between 2030-2050. The global goal is to keep the Earth from warming beyond 2 degrees, the point at which scientists predict catastrophic climate change will make the Earth unbearable.

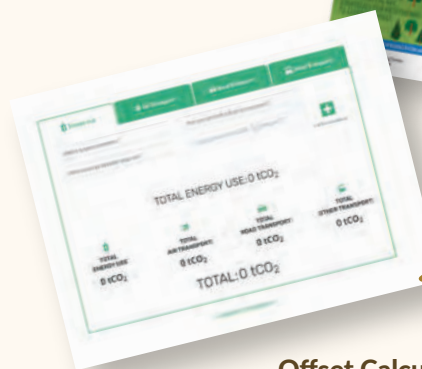
Countries around the world have met numerous times to try and determine a path to curb emissions and avoid 2 degrees of warming. These annual meetings are called the Conference of the Parties -or COP. While new targets and agreements are often reached, the majority of countries have recently (as of this writing) signed on to the Paris Agreement (2015) to reach net-zero emissions by 2050.

How can net-zero be achieved? There are many paths to take, all with a number of moving parts to transform and transition a lot of our daily emissions. Shifting individual behaviours will help, but will not be enough without legislation to incentivize cleaner technology and less pollution. Some approaches are already in place, such as a carbon tax (or price on pollution), eco or environmental levies, subsidies for new technologies, and lower-emission consumer choices. Putting in stricter waste and energy regulations, supporting cleaner fuel standards and the electrification of grids with cleaner transition fuels or renewable energies all require both corporations and governments to act, along with public pressure from citizens to support governments and companies that put sustainability first.

## Learn more about the effects of Climate Change using these tools:

### Climate Change 101 Infographics (Ingenium Canada):

six posters explore impacts on biodiversity, the economy, and more.



### Offset Calculator (Tree Canada):

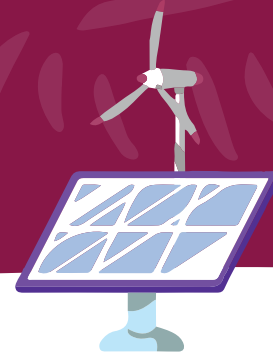
Calculate your carbon footprint and the amount of trees required to offset your emissions.

### Climate Atlas of Canada (Prairie Climate Centre):

A virtual map showing local climate impacts and projections



# 5 Things to Know About Climate Change



## 4. Plants, soil, and food are part of the solution

The planet is equipped with a powerful tool for stabilizing the climate: nature itself. Protecting nature today, such as plant habitats and soil, means a better planet for future generations.

Two different kinds of solutions need to come together: adaptation (preparing for the new normal of climate change) and mitigation (reducing future carbon emissions to curb increased climate change).

As the lessons help to explore, some of our major global solutions to curbing greenhouse gas emissions include plants, food and soil. Preventing deforestation will help keep carbon stored within trees and plants, and many countries are working to reforest and do mass tree plantings as one solution.

Reducing food waste and shifting the planet's diet to low-impact foods and less meat are also major plant-connected solutions that help plant ecosystems throughout the world. Less land, water, and energy is required when the food produced is actually eaten, and the lower in the food chain the product is. Out of a top list of personal actions for the planet, switching to a plant-based diet is high up there (along with having smaller families, taking less flights, and going car-free).

As you'll explore in the lesson plans, soil -and oceans too!- store a great deal of carbon if left undisturbed. Useful agroecology methods such as solar-powered drip irrigation, intercropping (growing two crops close together for efficiency), and fast-growing plants used as green manure all help the soil to remain undisturbed.

**"We can't undeniably see climate change. Nothing is intrinsically different, just more intense or frequent—storms, droughts, heat waves, cold. We can't see the primary pollution source, and we don't have remediations that are relatively easy, cheap and acceptable to everyone."**

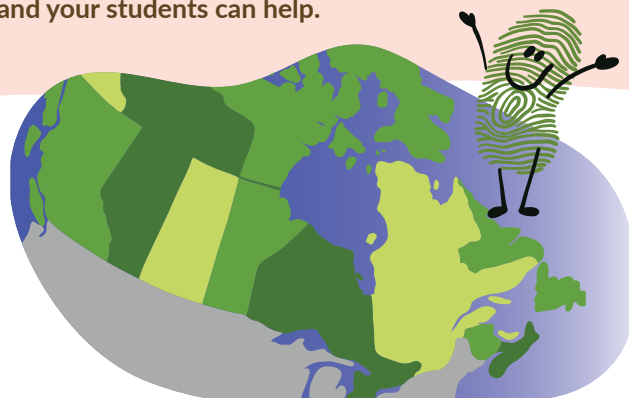
**- Stephen Strauss**

## 5. The impacts are more costly than the solutions

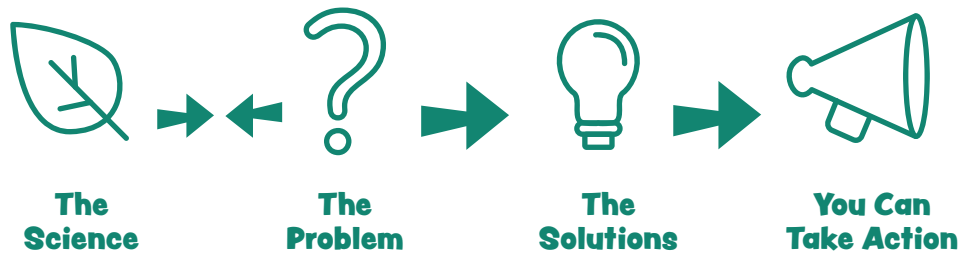
A report in the US predicts that if significant steps are not taken to rein in global warming, the damage will knock as much as 10 percent off the size of the American economy by century's end. In Canada, similar numbers show a huge impact on the Canadian economy if actions are not taken to curb extreme climate change. We are already paying for climate change now. For example, while severe weather events used to account for one percent of Canada's gross domestic product (GDP), that number is now closer to five or six percent.

Due to Canada's large resource extraction and natural resources economy, people are often worried about the cost of the transition to a low-carbon economy for Canadian jobs and employment. However, an energy transition is already in progress given the huge drop in prices for solar and wind energy installations. Overall, renewable energy creates more jobs than fossil fuels when measured per unit of energy. The construction, installation, maintenance and operation of renewable energy systems will help build a number of new jobs in the future, a sound alternative to the high costs on society of doing nothing.

**Climate change impact and actions can be highly localized. Look up what your local community, province or territory is doing on climate change to get a better idea of how you and your students can help.**



# What Kids Need to Know About Climate Change



Kids need some **foundational science concepts**. This includes understanding the green house effect, the difference between climate and weather, along with a systems thinking approach to the causes and effects of climate change on various ecosystems.

Kids need to **understand the problem** - just what is climate change and how is it affecting people, animals, plants and our environment?

Kids need to know **there are solutions**, what those solutions are and that many people are working on these solutions: from farmers, to politicians, to conservationists, to economists and everyday people. Important agreements and worldwide actions, such as those led by the United Nations, government bodies, local groups, as well as climate conferences and summits are ensuring positive action on climate change by people and organizations around the world.

Kids need to know that they **can take action and make a difference**.

## Science Concepts



- The difference between weather and climate: climate is the average pattern of weather conditions over a long period of time. Climate isn't weather—weather changes daily.
- Climate change will shift climate across the country in different ways and to different extremes.
- The major greenhouse gases through industrial emissions (carbon dioxide, methane, and nitrous oxide) and how they are commonly emitted.
- The amount of CO<sub>2</sub> equivalents in the atmosphere (in parts per million) that is safe (under 350) vs. dangerous (over 400).
- The impacts of 1.5 vs. 2 degrees of average global

warming.

- There are large-scale solutions and ideas, and then there are things we each can do in our everyday lives (this is where the actions of our students come in.)
- While actions such as changing lightbulbs and recycling more are important steps, they need to lead to larger collective actions.
- The collective impact we can take is important!

## Understanding the Problem

- Climate change starts with an understanding of the greenhouse effect in the atmosphere. As greenhouse gases are trapped in the atmosphere, less heat can escape through our atmosphere, and the earth's climate increases.
- Global warming and climate change are two different terms with a subtle, but important difference (not everywhere is warming).



## Finding Solutions

- Individual ways you can take action (the food you eat, how you spend your free time, who you vote for when you become an adult)
- Family or household actions (how much waste and energy you use, what you consume and choosing low-carbon activities such as gardening, biking, etc.)
- School and community actions (green plans and infrastructure projects, increased renewable energy and electric vehicle charging stations)
- Nature-based solutions across these sectors (tree planting, land and ocean conservation, restoring wetlands, forests, and natural grasslands).



# What Kids Need to Know About Climate Change

## The Climate High-5

My Climate Story has a great way to explain five things about climate change to young learners. Take a look at it below, and explore it further in Lesson 4 of My Climate Story.

### My Climate Story: Climate high-5

### Lesson 4

Can you remember these five key messages about climate change?



# Getting Started Plan (Teacher Tips)

## Look For Help!

This resource encourages you to explore some pretty big topics. But you're not alone.

- Think about colleagues, community members, and parents that might serve as a support network.
- Bring up your climate change education activities with your school administration in advance if you are concerned about pushback or concerns.
- For some communities and age groups, you may want to inform parents about the content you will be discussing in class. Outline your intentions, and show the curricular connections.
- Keep your tone optimistic and solutions-based. Remember that a complex issue doesn't mean that everything is going to be clear all at once.
- By taking a plant-based approach, you can decide on the level of climate change education you'd like to integrate into your teaching on plants and plant habitats. The extensions are there for you where they make sense.
- Localize the learning. Explore how climate change is impacting your community, and bring in a plant or planet protector such as a local environmental organization, a scientist, or a city official to talk about the environment. Better yet, get your students outdoors for these conversations!
- Don't leave your students without agency; take up some problem-based learning and explore solutions together. (For a primer, check out Lesson 8).

## You're Not Alone! Reach Out & Build Your Support Networks

- Join a provincial environmental education specialist group in your local community.
- For Little Green Thumbs teachers, join the LGT Teacher's Facebook Group
- EECOM is a national network of environmental educators that hosts an annual conference. Watch video highlights from presenters online.



# Appendix/Glossary

All glossary definitions below come from Environment & Climate Change Canada, unless otherwise listed.



**Climate:** The average pattern of weather conditions over a long period of time..in a narrow sense is usually defined as the average weather or, more rigorously, as the statistical description in terms of the mean and variability of relevant variables over a period of time ranging from months to thousands or millions of years. Variables taken into account most often include surface temperature, precipitation and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.

**Weather:** State of the atmosphere at a given time and place with regard to temperature, air pressure, humidity, wind, cloudiness and precipitation. The term is mainly used to describe conditions over short periods of time.

**Climate Change:** refers to a change in the state of the climate that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcing factors, or to persistent anthropogenic changes in the composition of the atmosphere or in land use.

**Global Warming:** The increase in Earth's average temperature over a long period of time, caused by the trapping of greenhouse gases in Earth's atmosphere, which prevents heat from escaping Earth.



**Greenhouse Gas:** Gases, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, by the atmosphere itself and by clouds. Water vapour (H<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>) and ozone (O<sub>3</sub>) are the primary greenhouse gases in the Earth's atmosphere. In addition, there are a number of entirely human-made greenhouse gases in the atmosphere, such as the halocarbons and other chlorine- and bromine-containing substances.

**Plant Adaptation:** The ways in which plants are able to change and adjust if their needs are not being met. This may include shifting their habitat to one more

conducive to reaching these needs, or adjusting position.

**Plant Needs:** requirements for plants to survive and thrive. Includes a particular type -or amount- of light, air and air temperature, water, nutrients, and space to grow.

**Carbon Footprint:** The amount of carbon dioxide one human releases into the environment in a year. (Source: Climate Reality Project.)

**Photosynthesis:** The chemical process where plants take in water, sun, and carbon dioxide and convert this to energy, releasing water and oxygen as byproducts.

**Greenhouse Effect:** the process in which the absorption of infrared radiation by the atmosphere warms the Earth. In common parlance, the term 'greenhouse effect' may be used to refer either to the natural greenhouse effect, due to naturally occurring greenhouse gases, or to the enhanced (anthropogenic) greenhouse effect, which results from gases emitted as a result of human activities.

**Carbon Cycle:** the natural movement of carbon compounds throughout the Earth, including respiration by animals, storage within plants, soil, and water systems, as well as in the atmosphere.

**Carbon Dioxide:** a gas formed by carbon and oxygen that has no odour or colour. Formed from the burning of organic compounds and respiration, and stored by plants in photosynthesis. One of the major greenhouse gases.

**Ecosystem:** the interactive system formed from all living organisms and their abiotic (physical and chemical) environment within a given area. Ecosystems cover a hierarchy of spatial scales.

**Habitat:** the location and environmental conditions in which a particular organism normally lives. (Source: Greenfacts.org)

**Fossil fuels:** coal, oil, and natural gas, which come from the breakdown of ancient plants and animals over millions of years. (Source: Climate Reality Project)

# Appendix/Glossary

**Invasive Species:** a species of plant or animal that is introduced to a region and takes over an ecosystem from the original species within that ecosystem. Often introduced through human travel and impact, intentionally or unintentionally.

**Methane:** a gas released from fossil fuel production and the main gas in natural gas. A greenhouse gas that has a much stronger impact in the atmosphere than carbon.

**Intergovernmental Panel on Climate Change (IPCC):** a panel established by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988 to assess scientific, technical and socioeconomic information relevant for the understanding of climate change, its potential impacts, and options for adaptation and mitigation.

**Adaptation:** in the context of climate change, adaptation focuses on approaches and strategies to deal with existing -and future- impacts of increased climate change, such as weather-proofing buildings, infrastructure, and food systems for more extreme weather or global warming.

**Mitigation:** In the context of climate change, mitigation is an anthropogenic intervention to reduce the anthropogenic forcing of the climate system; it includes strategies to reduce greenhouse gas sources and emissions and enhance greenhouse gas sinks.

**Traditional Knowledge:** cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment.

**System Thinking:** an approach to viewing the world with a focus on connections, interrelationships, and interdependence between a number of elements.

**Weather:** describes the conditions outside right now in a specific place. For example, if you see that it's raining outside right now, that's a way to describe today's weather. Rain, snow, wind, hurricanes, tornadoes — these are all weather events.

