



Part A: Exploring the Arctic - Teacher Guide

Setting the Stage

In this activity, students share their existing knowledge about the Arctic and build a concept map of different aspects of the Arctic environment. Students try to define the Arctic, then complete a reading, and finally peer-review their definitions.



Alpine Tundra vegetation. Photo Credit: Wikimedia Commons

Lesson Overview

In this sequence of lessons, students will define and learn about the Arctic.

- **Lesson 1** – (40 minutes) *Concept Mapping Arctic*
Students will define the Arctic through concept mapping
- **Lesson 2** – (35 minutes) *Exploring Vegetation in the Arctic*
Students will read an article to learn about landscapes and vegetation in the Arctic.
- **Lesson 3** – (35 minutes) *Exploration of the Arctic's Indigenous Populations*
Students will use an article and a map to learn about Indigenous peoples in the Arctic

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Instructional Overview	
Grade Level	Middle/High School
Instructional Time	110 minutes (<i>total time needed</i>)
Activity 1 Goals	- Define what the Arctic is - Describe the Arctic environment and life of Indigenous peoples - Define how feedback loops work, specifically the effects of albedo
Lesson Driving Question	- What is the Arctic? - Why are so many scientists studying the Arctic?
Building Toward	NGSS: ESS2D , LS2C
Three Dimensions	Science and Engineering Practices: - Asking and Defining Problems - Planning and Carrying Out Investigations - Analyzing and Interpreting Data - Using Mathematics and Computational Thinking Disciplinary Core Ideas: - ESS2: Earth's Systems - ESS3: Earth and Human Activity Crosscutting Concepts: - Patterns - Cause and Effect - Energy and Matter: Flows Cycles & Conservation
Materials	☐ Student Guide ☐ Student Worksheet (Student worksheet includes both Part A and Part B questions) ☐ PowerPoint with all relevant images ☐ Whiteboard for class concept map ☐ "Passport to the Arctic" - background readings ☐ Part 2 Reading "Landscapes and Vegetation Zones" ☐ Part 3 Reading "Populations" ☐ Video streaming capacity
Material Preparation	☐ Print copy of "Passport to the Arctic" for each student ☐ Print copy of Student Worksheet for each student
Vocabulary	<u>Arctic</u> - The Arctic is a polar region surrounding the North Pole, characterized by extreme cold, ice-covered seas, permafrost, and unique wildlife. <u>Tundra</u> - The tundra is a cold, treeless biome characterized by low temperatures, short growing seasons, and permafrost, found in Arctic and high-altitude regions. <u>Polar Desert</u> - A polar desert is a cold, dry region with minimal precipitation, sparse vegetation, and permanently frozen ground, found in Antarctica and the Arctic. <u>Taiga</u> - Cold forest biome dominated by coniferous (pine) trees, stretching across northern North America, Europe, and Asia.



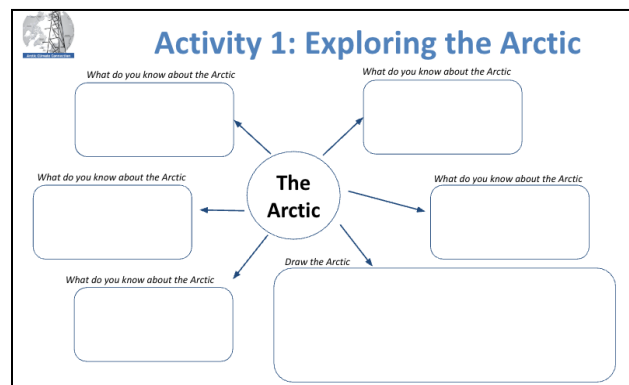
	<u>Nomadic</u> - Describing communities that move from place to place rather than settling permanently.
Instructional Strategies	• Concept Mapping: A visual tool used to organize and represent knowledge. It consists of nodes (concepts) connected by labeled links that show relationships between them. Concept maps help in learning, brainstorming, and problem-solving by illustrating how ideas connect.

Lesson 1: Concept Mapping (40 min)

What is the definition of the Arctic?

1. (Slide 3) Document your understanding of the Arctic. To do this, complete a concept map titled “*What is the Arctic?*”. Consider the following questions:

- What makes the Arctic unique?
- What do you know about the environment, climate, plant cover, animals, human activity, habitability, natural resources, politics, history, populations, and other aspects that come to mind?
- Sketch the Arctic.



2. In small groups, create a group concept map to show how the different aspects of the Arctic relate to each other based on the individual concept maps of each group member.

3. Create a whole-class concept map by combining the small group concept maps into one class concept map.

4. Definition of the Arctic:

- Using a blank piece of paper, write down a possible definition for the Arctic in your own words.
- Crumple up the paper with the definition and toss it to someone else (The “crumple and toss” or snowball fight activity is a fun break and allows for anonymous peer review). Everyone tosses the papers until definitions are well mixed, and each student has one definition (that is not their own).
- Compile all definitions on a shared class sheet (or whiteboard). Come to a class consensus about the best definition for the Arctic. Now, read through the background



materials “[Passport to the Arctic](#)”. Revisit the definitions on the shared class sheet and the definition in front of you.

- What are the four possible definitions of the Arctic?
- Which of the four possible definitions of Arctic are listed on the class sheet?
- Which of the four definitions in the background reading is the closest to the definition you have in front of you?

Lesson 2: Exploring Vegetation in the Arctic (20 min)

How does the Arctic environment affect plant life?

Reading: Landscapes and Vegetation in the Arctic. When thinking about the Arctic, many people usually think of images of snow and ice. However, the Arctic is covered with vegetation and is home to many animals and people. Read the following background materials on “[Landscapes and Vegetation in the Arctic](#)” by the Russian Geographical Society:

Guiding questions for the reading “Landscapes and Vegetation in the Arctic”:

- In which of the four Arctic landscapes are trees found?
- What is permafrost?
- Where does permafrost occur?
- Why do we care about Arctic vegetation?

Extension: Explore vegetation growth and greening of the Arctic (15 minutes)

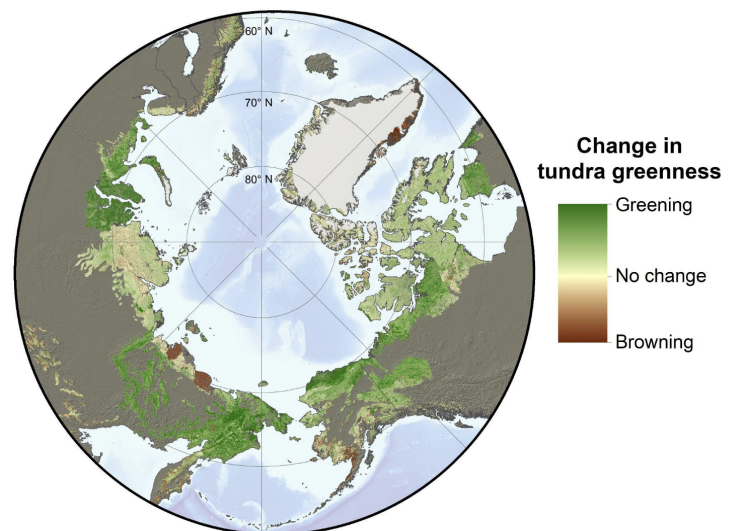
How are rising temperatures and climate change influencing plant growth in the Arctic?

Learn about vegetation in the Arctic:

- (slide 4) Watch the [Greening of the Arctic](#) (Video 3:34, AMNH)
- (slide 5) Explore the NASA visualization about Vegetation in the Arctic.

Consider the following questions:

- Where do trees extend furthest north in the Arctic?
- What geographic setting seems to allow trees to grow further north?



Change in Tundra greenness. Photo Credit: NASA

**Lesson 3: Exploration of Arctic's Indigenous Populations** (20 minutes)

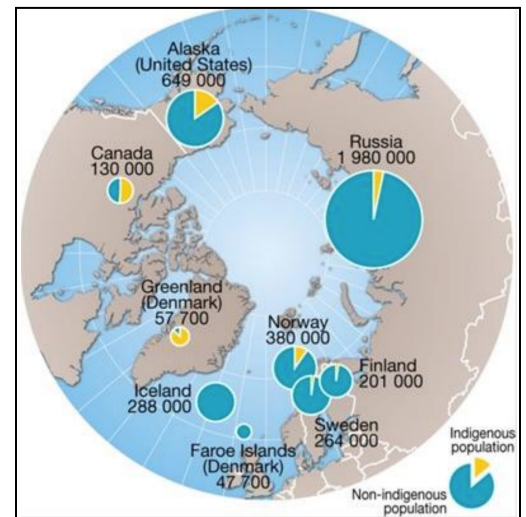
How do Indigenous people live in the Arctic?

1. Read a [short article](#) about the “Indigenous Peoples of the Arctic” from the Arctic Council or “[Population of the Arctic](#)” from the Russian Geographical Society.
2. Take a look at the two maps below that show the [Native lands of Indigenous Peoples](#) and the [Population distribution in the Arctic by country](#).

Guiding questions:

- What percentage of the Arctic population is comprised of Indigenous people in Canada, Greenland and Russia, respectively?
- What priorities do the six Arctic Indigenous Organizations that are part of the Arctic Council have?

Population distribution in the circumpolar Arctic, by country. *Photo Credit: UNEP*

**Extension: Documentary of Arctic People and Climate Change** (15 minutes)

How are people living in the Arctic affected by climate change?



(Slide 6) Watch the following documentary about the Inuits in Sachs Harbor, Canada

[Eyewitness of Changes in the Arctic's Climate \(5:33 min\)](#) from Smithsonian Institution / National Museum of Natural History:

Guiding questions:

- What effects of climate change are being reported by the Inuit people of Sachs Harbor?
- How are scientists working together with these Sachs Harbor citizens?

Find more curriculum here:

<https://ceee.colorado.edu/lesson/arctic-climate-connections>