This presentation aims to teach you about the Arctic.

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#### What is the Arctic?

At the northernmost part of Earth, there is a polar region called the Arctic. It is comprised of the Arctic Ocean, adjacent seas, and parts of Alaska, Canada, Finland, Greenland, Iceland, Norway, Russia and Sweden.

Scientists do not agree on a strict definition of the Arctic. The most commonly held definition is the region above the Arctic Circle. The Arctic Circle is an imaginary line that circumscribes the globe at approximately 66° 34' N.

However, other scientists place the Arctic area north of the arctic tree line where the landscape becomes frozen and is only dotted with shrubs and lichen. Still, others base the area of the Arctic off of temperatures. This definition places the Arctic as any location at a high latitude where the average daily summer temperature does not go above 10 °C.



### **Importance of the Arctic**

Frozen ocean water is called sea ice and it forms, grows, and melts in the Arctic Ocean. During the majority of the year, sea ice is covered in snow. Sea ice plays a direct role in the global climate by keeping the polar regions cool.

Sea ice plays an important role in the Arctic because it:

- 1. Reflects sunlight to bounce heat back to space
- 2. Influences ocean currents
- 3. Insulates the air
- 4. Keeps methane levels down
- 5. Limits the development of strong storms
- 6. Supports native peoples
- 7. Supports native wildlife



#### **Arctic Phenomena**

There are special atmospheric conditions that occur only in the Arctic. People are able to often see and hear phenomena that they would not be able to experience anywhere else on Earth.

The cold temperatures coupled with the microscopic ice crystals that are suspended in the air makes light and sound travel differently in the Arctic. Optical illusions are created by the layers of hot and cold air which cause the light rays to refract or bend off the surface of the ice, clouds, and water. The cold atmospheric conditions cause strange phenomena with sound as well. People can hear noises from longer distances away due to the sound waves bending differently in the cold atmospheric conditions of the lower latitudes in the Arctic.

The aurora borealis is an amazing colour display in the sky over the Arctic Circle. It is centred around the geomagnetic North Pole. The aurora borealis is produced when a stream of protons and electrons emanate from the sun. This solar wind combines with the oxygen and nitrogen in the Earth's upper atmosphere to produce colours of light as the gases ignite. The various colours appear from the different gases at various altitudes.



#### **Arctic Ecosystem**

The northern polar ecosystem is influenced by environmental conditions in the Arctic. While extreme weather and climate conditions have prevented scientists from fully exploring the vast ecosystem of the Arctic, there is much we know about the interconnectedness of this harsh environment.

Despite the inhospitable conditions of ice, snow, darkness, and winds, the Arctic ecosystem teems with abundant life. The building blocks of this ecosystem are algae and phytoplankton. Algae and phytoplankton create sustenance from the rays of the sun that support fish and plankton which provide food for birds and walruses, seals, and even whales. As the top Arctic predator, polar bears thrive on the animals below them in the food web.

Changes in the food web threaten the fabric of arctic life. The creatures that survive in the harshest conditions on Earth are not exempt from the effects of global climate change.



#### **Climate Change and the Arctic**

The Arctic feels the ramifications of human-caused, global climate change. Temperatures have increased in the Arctic more than any other area on Earth over the last 30 years. The first changes in the Arctic climate were found in the 1970s and 1980s. Scientists have tracked Arctic warming over the last several decades. The change between the first half of 2010 and the reference period (1968 to 1996) has been an increase in 4 °C.

Changes are occurring to the sea ice, snow cover, and amount of permafrost which effects the entire planet. Arctic warming has caused the sea ice cover to decline as well as the snow cover over land. Northern Canada and Greenland's glaciers are melting and retreating. Previously frozen ground has also begun to warm and thaw out.



#### Laws of the Arctic

The Arctic does not have a single international governing body. Instead, there is an Arctic Council that works as a collective governing body for the entire region. The Arctic Council defines itself as the leading intergovernmental forum promoting cooperation, coordination and interaction among the Arctic States, Arctic indigenous communities and other Arctic inhabitants on common Arctic issues, in particular on issues of sustainable development and environmental protection in the Arctic.

The Arctic Council is comprised of multiple Working Groups that assess and recommend decisions based on their extensive analysis. Decisions are made by consensus among the eight Arctic Council States, with full consultation and involvement of all Permanent Participants.



#### **Territorial Claims**

The Arctic is an area of land that encompasses the three continents of Asia, Europe, and North America. Within these three continents, there are eight Arctic states. However, none of these eight states falls entirely within the Arctic region. The Arctic actually only covers the northernmost region of these states.

National waters are territorial waters that are 22 kilometres or 12 nautical miles off the coast of a country. Denmark, Norway, Russia, Canada, and the United States all have national waters that are in the Arctic region. This is significant because of the untapped resources that are becoming more readily available due to climate changes allow for enhanced economic opportunity.

The receding sea ice has opened new passages for maritime travel which has sparked fresh debates over the Arctic landmass. The Law of the Sea Treaty granted portions of the Arctic and its resources up to 320 kilometres from land to Canada, Russia, Norway, Denmark, and the United States. The treaty allows the majority of the formal decision making power to go to regional organisations such as the Arctic Council.



#### **Exploration and Exploitation**

The Arctic is truly the new scientific frontier. Scientists have been studying the sea ice, the water column, and the seafloor using the latest cutting-edge technology.

A high definition camera mounted on a remotely operated vehicle has recently travelled as deep as 9000 feet. The information that it gathered has unveiled views into the frigid waters that have never previously been seen by scientists. Collecting samples of organisms in the water can now be accomplished using ROV, multi-nets, and bottom trawlers which allow us to peer deeper into the unexplored world of arctic sea life.

"Ice coring" is a technique used to gather data and information about sea ice algae. As scientists assemble this new knowledge and data, they are able to unmask the mysteries of the Arctic food web.

Major oil and gas companies vie for access to the rich reserves in the Arctic, aligning superpower against superpower. While the territorial boundaries remain unclear, what is known is that control over these resources will bring economic wealth and prosperity to the winner.



### **Fun Facts**

- "Arctic" comes from a Greek word meaning bear. It refers to two constellations "Little Bear" and "Great Bear" in the northern night sky;
- The coldest temperature ever recorded in the Arctic is around –70 °C;
- Because of the Earth's tilt, at least one day a year there is an entire day of darkness and also a full day of sunshine;
- Approximately four million people, called Inuits, live in the Arctic region;
- One species found only in the Arctic is the narwhal, often called the "unicorn of the sea";
- In 1958, a submarine called the USS Nautilus sailed beneath the frozen ice of the Arctic Ocean and proved that the enormous ice sheet rest on water and not land.



### Australian Curriculum Mapping

GRADE 5 SCIENCE (ACSSU043): Living things have structural features and adaptations that help them survive in their environment.

GRADE 6 SCIENCE (ACSSU094): The growth and survival of living things are affected by the physical conditions of their environment.

YEAR 7 SCIENCE (ACSSU112): Interactions between organisms, including the effects of human activities can be represented by food chains and food webs.

YEAR 9 SCIENCE (ACSSU176): Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems.

SUSTAINABILITY (01.2): All life forms, including human life, are connected through ecosystems on which they depend for their well being and survival.



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Download our mobile game app, World of the Wild, and see how you can participate in virtual wildlife conservation.



