

POLAR BEARS & THE ARCTIC



Teacher Resource Package

POLAR BEARS & THE ARCTIC

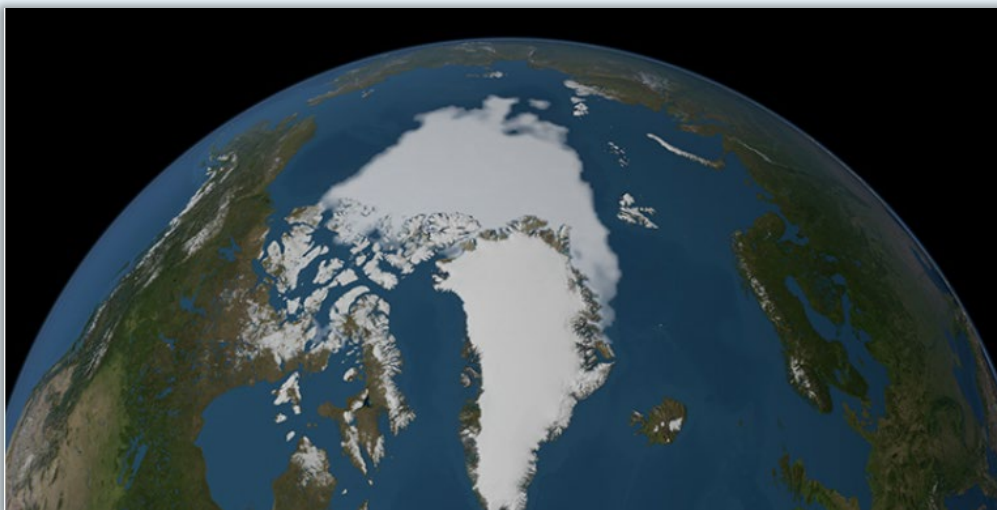
What does the future have in store?

With only 20,000 to 25,000 left in the wild (60% are found in Canada!), polar bears are currently classified as vulnerable. However, if climate change continues at its current rate, they could quickly become critically endangered, as the sea ice they rely on for hunting disappears. The loss of polar bears would have a significant impact on other Arctic species, as they are an essential part of the tundra ecosystem. Now is the time to act and make changes to reduce our carbon dioxide emissions.

Arctic Ice Coverage – Summer Minimum



1979



2012

Did You Know?

Latin Name: *Ursus maritimus* ('sea bear')

Status: **Vulnerable**

- Polar bears are the **largest** land predator in the world, with adult males weighing 400-600 kg (almost as heavy as a small car!) and standing over 3 m.
- At 30 cm across, their large paws help to distribute their weight while walking on thin ice, like a snowshoe.
- Superb Swimmers – Swimming from ice floe to ice floe, they use their front paws as paddles and hind legs as a rudder to help them steer.
- Patient Polar Bears – They are known to wait for hours at ice openings/breathing holes for ringed seals (their favourite food!) to pop up.
- With a layer of fat 11.5 cm thick and a dense, insulating fur coat, polar bears have no problems staying warm and often overheat when they run.
- Not Quite White – While they may appear white, their fur is actually transparent with a hollow core that scatters and reflects visible light and their skin is black!
- While they can reach speeds of 40 km/hr, they prefer a slow, methodical walk to save energy.
- At birth, cubs weigh less than 0.5 kg, which is about the size of a cell phone!
- Cubs stay with their mother for up to 2.5 years while they learn to hunt and survive the harsh Arctic environment.
- Key to Survival – Relying on ice to hunt seals, breed, and den, polar bears cannot survive without the Arctic sea ice.

21 WAYS YOU CAN SAVE POLAR BEARS AND THE ARCTIC SEA ICE



1. **Reduce, Reuse, Recycle!**
2. **Lights Out** – turn off lights when not in use.
3. **Breathe Easy** – plant a tree or garden.
4. **Don't be a Litterbug!**
5. **Less Plastic** – use reusable water bottles & bags.
6. **Drive Less** – walk, cycle, carpool, or take public transportation.
7. **Save Water** – turn off taps when not in use & take shorter showers.
8. **Phantom Power** – unplug appliances (e.g. toaster, hair dryer, laptop, phone charger, etc.) when not in use.
9. **No Idling** – turn off vehicles while waiting (including at a drive-thru).
10. **2 Up, 2 Down** – turn thermostat down in winter & up in summer.
11. **Hang to Dry** – avoid the dryer & hang your clothes to dry.
12. **Recharge** – use rechargeable batteries.
13. **Buy Local, Buy Less, and Buy Smart!**
14. **Eliminate Styrofoam** – it doesn't decompose!
15. **Compost!**
16. **Meatless Mondays** – eat 1 or more meatless meals a week.
17. **Heat-Busters** – weatherize your house to stop air leaks & prevent heat loss.
18. **Bright Idea** – replace old light bulbs with energy efficient LED or compact fluorescent bulbs.
19. **Lead by Example** – learn, take action, encourage others to follow.
20. **Speak Up & Spread the Word** – organize a campaign or event to educate others & raise awareness about conservation issues.
21. **Adopt a Polar Bear** – raise money & donate to a conservation organization.

Take action today, protect our planet for the future!

HOW TO INCORPORATE POLAR BEARS INTO YOUR LESSONS

- Prior Knowledge – Find out what your students already know about polar bears, the Arctic, climate change, and other environmental issues through discussions or graphic organizers.
- Brainstorm actions that students can take to reduce their impact on the environment. Use the '21 Ways to save polar bears and the arctic sea ice to get you started or as a reference.
- Research the impact that a specific action (e.g. turning off lights) has on the environment.
- Make a polar pledge (templates provided)!
- Check out [Toronto Zoo's YouTube channel](#) for polar bear cub videos.
- Check out [Polar Bears International](#) for polar bear facts, teacher resources, polar bear tracker map, and videos.

AND

Check out the next few pages for additional curriculum-linked polar bear lesson ideas & activities!



- Experiment with **'Blubber Gloves'** to investigate how polar bears stay warm.
- How have polar bears adapted to survive in the tundra ecosystem? Are their physical and behavioural adaptations unique to only polar bears?
- Explore water, ice, and snow and investigate how ice melts.
- Brainstorm different ways that polar bears move to meet their needs. Do they move similarly or differently than other Arctic animals? Other bears?
- The 5 Senses – Which sense is most important to a polar bear? Why?
- Explore the polar bear's life cycle. Watch videos of Humphrey, the polar bear cub, growing up on [Toronto Zoo's YouTube channel](#). How does the life cycle of a polar bear compare to other mammals? Birds? Reptiles? Amphibians? Fish? Insects?
- How do the seasons in the Arctic differ from the seasons experienced in other regions of Canada? How are they the same?
- Explore plant life in the Arctic – How do the characteristics of plants in the Arctic differ from plants found in other ecosystems? How do plants and animals in the Arctic depend on each other for survival?
- How does the Arctic's climate impact a plant's ability to grow? Find out by growing plants under different conditions (e.g. amount of light, temperature).
- Explore the biodiversity of tundra ecosystem, including within species, among species, and in the ecosystem. Compare to other ecosystems around the world.
- Construct an Arctic food chain or web – Identify species as producers/consumers/decomposers, as well as carnivores/herbivores/ omnivores. Identify the niche of each species in the ecosystem. What impact would the loss of polar bears have on the food chain?
- Compare and contrast polar bears to other species of bears.
- What is climate change? How is climate change impacting polar bears, the Arctic, and tundra ecosystems? How is it impacting other ecosystems around the world? What impact does climate change have on the water system?
- Debate – Can polar bears adapt to a life on land?
- Renewable vs. Non-Renewable Energy – Investigate the pros and cons of different energy sources, taking perspectives of different groups into consideration.

- Brainstorm adjectives that describe polar bears or the Arctic and use them in writing pieces.
- Create polar bear- or Arctic-inspired:
 - Comics
 - Poetry
 - Picture Books
 - Short Stories
- Read and understand the ideas communicated in a variety of texts about polar bears or the Arctic.
- Explore the legends and myths of the Inuit culture and then create your own.
- Persuasive writing – Write a letter to a person/company (or the school board) about why they should care about climate change and polar bear conservation.
- Explore the Inuit language and the meaning of words. Example: *Nanuk = polar bear*
- Media Literacy – Design/create a pamphlet, TV/radio ad, webpage, stop-animation video, poster, etc. that communicates an environmental message.
- Develop a board game, complete with rules, about polar bears and climate change.

THE ARTS

- Create polar bear art using a variety of materials. Bundle up the bears in hats and scarves!
- Use the elements of design to create polar bear or Arctic landscape art works.
- Create polar bear sculptures using recyclable materials.
- Experiment with warm and cool colours to represent the Arctic in the summer and winter.
- Explore print-making and make prints of Arctic wildlife.
- As a class, design, create, and build a three-dimensional Arctic-inspired diorama.
- Create a polar bear using your handprint. Write your **Polar Pledge** in the centre!
- Explore works of art created by Inuit artists, including stone sculptures.
- Creative Movement – Use a variety of body movements to move like a polar bear.
- Develop skits that will communicate an environmentally-friendly message. Present to other classes.
- Explore the traditional games, music, and dances of the Inuit culture.

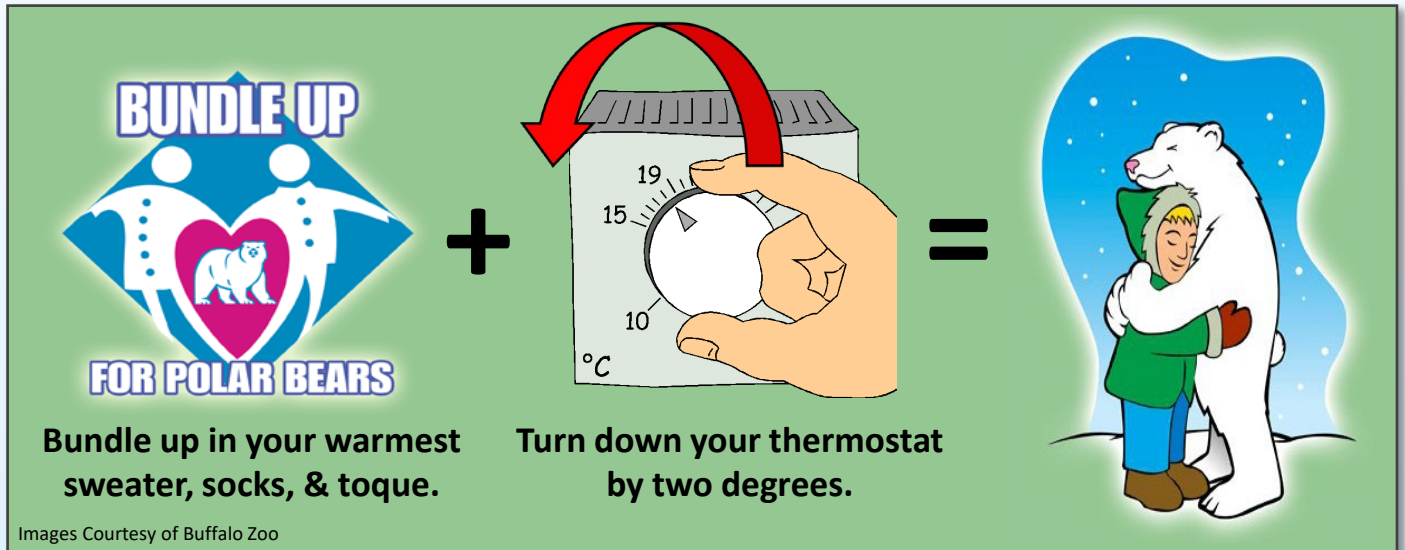
- Create a life-size polar bear (2D or 3D) – Use non-standard and standard units to measure its attributes (e.g. length, width, height, mass). Find other objects that are bigger than, smaller than, or the same size as it.
- Polygon Polar Bears – Create straight-edged polar bears and determine the perimeter and area, measure and classify the angles, and count the number of sides and vertices.
- Create polar bear- and Arctic-inspired artwork using two-dimensional shapes or three-dimensional figures. Describe the art using mathematical vocabulary.
- Explore a variety of patterns using Arctic wildlife pictograms.
- Represent the number of polar bears remaining in the wild using a variety of tools and manipulatives. Compare the number of polar bears living in specific countries (e.g. Canada vs Norway vs Greenland) or regions (e.g. 19 subpopulations).
- **PBI's Polar Bear Tracker Map** – Explore the distance travelled by each bear. Determine how far the bears travelled using references (e.g. travelled around the school X number of times). How far did they travel in a day, week, or month? Is that more or less than the distance the student travels?
- Track the number of students participating in Bundle Up and represent it in various ways.
- Create environmentally-themed surveys (e.g. What actions do students in the class take to reduce their impact on the environment?). Present the collected primary data in charts, tables, and/or graphs. Interpret the results and pose/answer questions related to them.
- What is the probability (e.g. certain, likely, unlikely, impossible) of a student or other individual taking a specific action to help protect the environment?
- Explore Temperature – How do changes in temperature affect everyday experiences? Use a thermometer to measure the temperature change as ice melts. Understand that a negative integer is less than a positive integer (e.g. -10°C is less than $+10^{\circ}\text{C}$).
- Investigate the relationship between weather, climate, and temperature changes over time in different locations (e.g. Arctic vs Southern Ontario vs a Tropical region).
- Read, represent, interpret, and draw conclusions from Arctic temperature or precipitation data published online. Calculate mean, mode, median.

- Explore the physical features/landforms of the Arctic/tundra. Compare how they differ from other regions in Canada and/or around the world.
- Explore the day-to-day lives, cultures, and traditions of people who live in regions of Canada and the world where polar bears live. Compare how they differ from other regions in Canada and/or around the world.
- Investigate how the climate and physical features of the Arctic/tundra affect how people, in those regions (e.g. northern sections of Ontario, Quebec, and Manitoba, Nunavut, Northwest Territories, and Yukon), including the Inuit, live.
- Explore why some environmental issues, such as climate change, are important internationally and require participation from other regions of the world.
- Examine the differing roles that different levels of government have in protecting the environment.
- Investigate the process of how laws are passed. Create a new law that will protect polar bears.
- Create a plan of action to address climate change or other significant environmental issue and specify actions to be taken by government and by individuals.
- Examine the short- and long-term impact of climate change, looking at both changes to the landscape and to how people live.
- Analyze how the Canadian government and/or NGO's have responded to environmental issues, such as climate change.
- Collect, analyze, interpret, and draw conclusions about data relating to climate change. How do governments and organizations use this data?
- Compare and contrast how different governments worldwide respond to environmental issues, like climate change.

- Explore various careers, including the education and training needed, related to polar bear conservation.
- Research scientists who have made significant contributions to polar bear research and conservation, including Dr. Ian Stirling and Dr. Steven C. Amstrup.
- Research how human activity is threatening the sustainability of the Arctic ecosystem.
- Compare and contrast biotic and abiotic characteristics of a sustainable and unsustainable Arctic ecosystem.
- Explain how climate change affects the equilibrium and survival of ecosystems.
- Construct molecular models to represent the greenhouse gases and describe their physical and chemical properties. Conduct appropriate chemical tests to identify the gases based on their chemical properties.
- Identify indicators of global climate change.
- Analyze different sources of scientific data for evidence of both natural climate change and climate change influenced by human activity.
- Design and build a model illustrating the natural greenhouse effect and use it to explain how humans are enhancing it (e.g. anthropogenic greenhouse effect).
- Analyze current and/or potential effects, both positive and negative, of climate change on natural systems and human activity around the world.
- Assess and evaluate the effectiveness of local or global initiatives that seek to address climate change and ensure the sustainability of the Arctic ecosystem. Propose further courses of action.
- Compare different perspectives and/or biases evident in climate change discussions in both scientific and non-scientific media.
- Assess the social, economic, and environmental implications of the production of energy from renewable and non-renewable sources.
- Using the polar bear as a reference, explain the primary functions of a variety of systems. How do those systems respond in different situations (e.g. swimming, hunting, denning, etc.)?
- Explore how human activities can disrupt the balance that exists between cellular respiration and photosynthesis.
- What actions have been taken at school to reduce impact on the environment? Organize a school-wide initiative to further reduce the impact.
- Produce a plan of action to reduce energy consumption at home and/or at school and outline the responsibilities of various groups to ensure the plan's success.

- Explore various careers, including the education and training needed, related to polar bear conservation.
- Research scientists who have made significant contributions to polar bear research and conservation, including Dr. Ian Stirling and Dr. Steven C. Amstrup.
- Analyze the impact that climate change might have on the diversity of living things worldwide.
- Create and apply a dichotomous key to identify and classify species in the Arctic ecosystem.
- Using bears as a reference, define the concept of speciation and explain the process by which new species are formed.
- Describe various factors that affect plant growth and compare and contrast plant growth in the Arctic vs. other ecosystems.
- Using polar bears as a reference, explain the concepts of interaction between different species (e.g. competition, predation, symbiotic relationship etc.).
- Explain how a change in the population of polar bears can affect the entire Arctic ecosystem.
- Explain the concept of a 'carbon footprint' and how it is used to measure the impact on the environment of a range of human activities.
- Calculate their personal carbon footprint and propose actions to reduce it.
- Plan and conduct a waste or energy audit within the school and propose a plan of action for reduction based on the findings.
- Analyze conventional and alternative energy technologies and evaluate them in terms of their efficiency and impact on the environment
- Explain the basic principles and characteristics of various types of renewable energy production (e.g. wind, solar, geothermal).
- Design and construct a working model of a device that uses an alternative energy source. Describe how the device would positively impact the environment.
- Describe technological advances or green technologies that aim to reduce impact on the environment.
- Analyze the relationship between climate and geology. Use geological records to assess the impact of long-term climate change on life on Earth.

Celebrate International Polar Bear Day by
Bundling Up for Polar Bears!



BUNDLE UP
FOR POLAR BEARS

Bundle up in your warmest sweater, socks, & toque.

Turn down your thermostat by two degrees.

Images Courtesy of Buffalo Zoo

We invite **YOU** to join the **Thermostat Challenge!**
February 27

By **'keeping it cool,'** you'll be reducing your CO₂ emissions and raising awareness about how taking action now can help protect the Arctic sea ice polar bears depend on for survival.



**Together, we can make
a difference!**

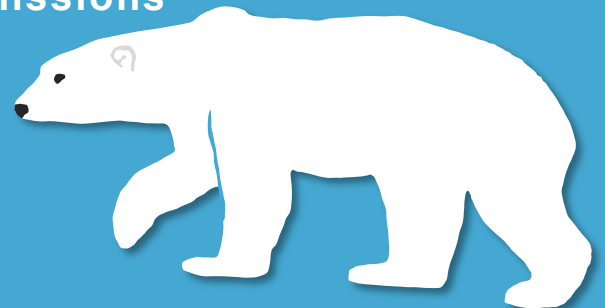
BUNDLE UP FOR POLAR BEARS!

Here's How to get your Students Involved in the Bundle Up Challenge:

1. **Announce the challenge** – Use social media and encourage others to participate
2. **Student Learning** – Integrate polar bears and conservation into your lesson plans and activities prior to and during the Challenge.
3. **Raise Awareness** – Have your students create an awareness campaign, educating other students and their families about polar bear conservation.
4. **Challenge** another school to take part in Bundle Up.
5. **Bundle up** in your warmest sweaters & turn down thermostat by two degrees on February 27.
6. Not able to turn down the thermostat? Make a **Polar Pledge** instead.
7. Celebrate **International Polar Bear Day** on February 27 by hosting a polar bear theme day at school (e.g. 'White Out' day where students dress in white).

What's the Impact?

Turning down your thermostat by just two degrees over the winter can reduce a typical household's CO₂ emissions by 225 kg. As CO₂ emissions are one of the primary causes of climate change, reducing emissions will help slow the melting of the Arctic sea ice that polar bears depend on for their survival.



Did you Know?

If all Canadians turned down their thermostat by just two degrees over the winter months, the amount of CO₂ emissions saved would be equivalent to taking over 350,000 cars off the roads!

My Polar Pledge

I will help save and protect polar bears
and their Arctic habitat by:



Together, we can make a
difference!

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and their Arctic habitat by:



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My Polar Pledge

I will reduce my impact on the environment and protect polar bears and the Arctic sea ice by:



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My Polar Pledge

I will reduce my greenhouse gas emissions and protect polar bears and the Arctic sea ice they depend on by:



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