

- POLAR BEAR FUN FACTS
- POLAR BEAR Q&A
- WHY POLAR BEARS MATTER
- THE THREATS POLAR BEARS FACE
- HOW WWF IS HELPING POLAR BEARS
- WHAT KIDS CAN DO



TEACHING TOOLS ABOUT

POLAR BEARS



WILD CLASSROOM



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WWF's Wild Classroom connects educators and parents with the tools and resources they need to help kids explore and understand the world around them. Visit wildclassroom.org to choose from a growing library of animal- and nature-related teacher's guides, fact sheets, and activity plans that you can use to enhance your science, writing, art, and other lessons.

Together we can inspire the next generation to build a future where people and nature thrive!

POLAR BEARS

● Polar Bear Fun Facts

- Polar bears evolved from brown bears less than 500,000 years ago.
- The Latin name for polar bear is *Ursus maritimus*, which means "sea bear." Polar bears are classified as marine mammals because they spend most of their lives on the sea ice of the Arctic Ocean.
- Polar bears keep their fur clean to help insulate them against the cold. Dirty, matted, and/or wet fur is not as effective an insulator.
- Although polar bear fur appears white, it is actually clear. The hairs are hollow and contain no pigment. Reflection of the sun's light causes them to appear white.
- Polar bears have a thick layer of body fat, to help protect them from the cold air and water of the Arctic. Underneath the fur, their skin is black.
- Despite the extreme cold conditions of their environment, polar bears sometimes overheat. When this happens, they lie down in the snow to cool off.
- In addition to an upper and lower eyelid, polar bears have a third eyelid that helps protect their eyes from the glare of snow and ice.
- Adult polar bear paws are about 12 inches wide, the size of a dinner plate. These large paws help evenly distribute their weight so they don't fall through the sea ice.
- Polar bears can swim up to six miles per hour by paddling with their front paws and holding their hind legs flat like a rudder.
- Polar bears spend over 50% of their time hunting for food. They store energy when sea ice and food are plentiful so that when food sources are scarce (usually during the summer and autumn), they can survive on fat reserves.



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- Because they need large amounts of fat to survive, the polar bear's diet consists mainly of seals. They may catch only one or two out of every 10 seals they hunt. When sea ice and food are scarce, they may travel to land to prey on smaller animals, scavenge for animal remains, or eat things like eggs and berries.
- Polar bears have an excellent sense of smell that can detect breathing holes in the ice, indicating a seal beneath as much as three feet of snow. The bear will sit perfectly still next to the breathing hole, sometimes for hours or even days, waiting for a seal to emerge for air.
- As polar bears spend more time on land due to shrinking sea ice, and as grizzly bears head further north as the climate warms, the two species have mated, in rare cases producing half-grizzly, half-polar bear hybrids referred to as pizzly or grolar bears.





● Polar Bear Q&A

What is a polar bear's extinction risk?

Polar bears are currently listed as vulnerable.

How many polar bears are in the wild?

22,000–31,000

Where do polar bears live?

Polar bears live on ice-covered waters in the Arctic. Two-thirds of the total polar bear population is found along the icy waters of Canada.

What is a polar bear's weight?

800–1,300 pounds

How big is a polar bear?

Six to nine feet long

How many subspecies of polar bear are there?

Polar bears are divided not into separate subspecies but rather into subpopulations based on geographic location. Currently, there are 19 subpopulations around the Arctic.

How do polar bears raise their young?

Polar bears typically mate in the late spring, when sea ice is most plentiful. Pregnant mothers feed throughout the summer and fall, ensuring they have enough fat to sustain both mother and cubs. Females then build dens along sea ice or snow and give birth during the winter. When they're born, polar bears are only about the size of an adult guinea pig. A mother usually gives birth to one to three cubs, which stay with her for about 28 months.



● Why Polar Bears Matter

They represent the health of their environment.

Polar bears play an important role in the overall health of their marine environment. A top predator, they are vital to the balance and stability of their food chain, which includes fish. By protecting the polar bear, we're helping ensure the health of the entire Arctic food web, benefiting millions of people who depend on fish for food and income. As an indicator species, they are also studied so scientists can gain a broader view of what's going on in the Arctic. When they're unhealthy, it may be a sign that something is wrong elsewhere.

They are cultural icons.

Polar bears have been significant figures in Arctic culture for centuries. According to the Alaska Nanuq Commission, "nanuq" is a widely used term for "polar bear" in the indigenous languages of Alaska. Nanuq has a strong presence in folklore and tales throughout Alaskan history, many of which show a consistent theme of ceremonialism, respect, and the relationship between polar bears and humans.





● The Threats Polar Bears Face

Climate change is the greatest threat to polar bears. The Arctic is warming twice as fast as the rest of the planet; impacts are felt there first and are some of the most damaging in the world.

Loss of sea ice habitat due to climate change

Sea ice serves as feeding, resting, and breeding grounds for polar bears. They rely on sea ice as a platform from which to hunt seals, their primary source of food. As sea ice melts, the bears must travel longer distances in search of food and can suffer from malnutrition or starvation along the way. This decline in their health will affect their cubs; the main cause of death in cubs is lack of food or diminished fat reserves in nursing mothers. The rapidly melting sea ice threatens the populations of seals, which also depend on the ice to raise their young.

Industrial impacts

As sea ice is lost to climate change, providing less ocean accessibility for bears, more opportunities for industrial development become available. Expansion of oil and gas production generates an increase in shipping traffic that poses a greater risk to polar bears and their habitat. Accidental oil spills can affect entire food webs by spreading far beyond the spill sites and causing devastating destruction. Oil can also poison polar bears that ingest it while grooming their fur and/or eating contaminated prey.

Polar bear-human conflicts

With less sea ice available, polar bears are forced to spend more time on land. This leads to more frequent confrontations with local people in Arctic villages and towns. Unfortunately, these encounters can have deadly consequences for both humans and bears, as each may feel threatened and be injured or killed by the other in self-defense.

Illegal hunting

Local people of the Arctic are granted legal and traditional rights to hunt polar bears using traditional methods. Monitoring programs and hunting quotas have been established to keep the population numbers stable. Unfortunately, there are a few places where unreported and illegal hunting continue to occur.



● How WWF Is Helping Polar Bears and the Arctic

WWF is working throughout the Arctic to secure a future for polar bears.

Protecting their habitat

WWF tracks polar bears using satellite technology to monitor their range and discover how shifting sea ice has altered their movements. This technology also identifies where the polar bears feed, den, rest, and give birth. Using this information, WWF works to conserve these critical habitats by establishing nature reserves and protected areas. Scientists believe there is an area of ice in Canada and Greenland that may persist longer than the ice anywhere else. WWF works with partners and local people to establish an appropriate management plan for this “last ice area.” In addition to conserving ice habitat for Arctic species, the plan could protect the cultural heritage and economies of local communities.

Reducing human-bear conflict

WWF supports local polar bear patrol teams that help keep towns and bears safe. Better lighting near public places, deterrence tools like noisemakers and electric fencing, bear-proof food storage containers, and warning systems to alert communities to bears all help reduce conflict. In places throughout the Arctic, WWF arranges meetings for people to share their experiences and success stories with one another so humans and bears can better coexist.

Addressing climate change in the Arctic

WWF successfully advocated for countries with polar bear populations (Canada, Greenland, Norway, Russia, and the United States) to formally recognize the urgent need for a global effort to address the challenges of climate change. WWF also effectively advocated for the creation of an international polar bear management plan in which polar bear countries commit to work together to protect and manage the bears and their habitat.

Reducing industrial impacts

WWF collaborates with scientists, conservationists, and local people of the Arctic to oppose oil and gas development in areas that contain too many plant and animal species to risk exposure to spills. As a precautionary measure in areas where development does occur, we provide education on responsible oil spill prevention and response to ensure that wildlife is not harmed. WWF is also working to make Arctic shipping safer by preparing sensitivity maps that help vessels avoid fragile areas.



● What Kids Can Do

WWF works to protect polar bears and their Arctic habitat, and kids can help protect them right at home too! Here are some things kids can do to help slow the effects of climate change in order to save polar bears and other animals.

Be energy conscious

Unplug devices like video game consoles and cell phone chargers even when they're turned off (these electronics still use power even when they're powered down). You can also adjust your thermostat when you leave the house for energy efficiency and not waste air conditioning and/or heating. Try to walk, bike, or skateboard/rollerblade rather than use a car. Encourage family and friends to share rides and use public transportation. Suggest to your family or school that they explore renewable energy options such as solar panels or wind turbines.

Watch your water use

The water we use in everyday activities goes through an intense treatment process that requires a lot of energy before it gets to us. By saving water, you are saving energy. Limiting the amount of time that faucets are running while brushing your teeth and taking showers instead of baths will help avoid wasting water. Limit how often you run your washing machines, and be mindful of leaky faucets that also waste a lot of water.

Plant a tree

Carbon dioxide is a main contributor in the climate change feedback loop. Trees help slow the effects of climate change by absorbing some of the carbon dioxide in the atmosphere. This reduces the amount of carbon dioxide for oceans to capture. Trees also provide shade, which helps keep areas cooler, reducing the need for air conditioning.

Check out our polar bear tracker

WWF researchers are following the travels of certain polar bears in the Arctic. Collars are attached around the bears' necks, and their positions are transmitted via satellite back to the scientists. Tracking their positions helps researchers gain valuable information about the effects of reduced sea ice habitat and other threats on the bears' movements. Stay up to date with what is revealed about the polar bears WWF is monitoring using the [Polar Bear Tracker](#).



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Spread the word

Kids can talk with their parents and friends about what they have learned about polar bears and ask them to participate by doing the things on this list too!

Start a fundraiser to help polar bears and nature

By creating a fundraiser with WWF's Panda Nation, you're empowering your students to protect the wildlife and wild places they've been studying. It's a great opportunity to teach the importance of philanthropy and the difference we can make when we work together. Get started at pandanation.org.

● More Polar Bear Teaching Tools

Polar bear fill-in-the-blank word puzzle

At the end of this guide, you'll find a word puzzle (with an answer key) based on the educational content covered in this guide.

Polar bear learning activities

Within the Polar Bear Toolkit, you'll find six fun, engaging activities designed to help students learn about polar bears and their habitat:

Paw to Paw—Arts Education

Students learn about adaptations while creating plaster handprint models, comparing their own to that of the polar bear paw print.

Climate Trackers—Science

Students will gain an understanding of how much is affected when climate is altered, both in their own environment and society and in the Arctic, by observing patterns and creating climate timelines.

What's the Connection?—Science

Through cause-and-effect modeling, students will learn how their daily uses of energy are connected to the future of polar bears.

My Day on Patrol—Language Arts

After reading an excerpt from the diary of a polar bear patrol team member, students will create a journal entry imagining they are a part of the team protecting polar bears and people.



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Arctic Defense Team—Social Studies

Students will practice democratic leadership and responsibility by working together to create a powerful argument on why drilling in the Arctic should be prohibited.

Polar Bear Freeze—Physical Education

This polar bear-themed twist on a classic game allows students to understand the requirements and struggles of polar bears trying to catch a meal and stay alive.

Polar bear posters

Create an inviting learning space with these [free, downloadable posters](#) of polar bears (along with fun facts).

WWF Together app

For more fun, interactive tools and information about polar bears and other wildlife, download the [WWF Together app](#).



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POLAR BEARS



Name: _____

Date: _____

POLAR BEAR WORD PUZZLE

Complete the puzzle with words related to polar bears. Use your polar bear fact sheet to help you.

1. Polar bears keep their fur clean to help _____ heat.
2. Polar bears are classified as marine _____.
3. The extinction status of polar bears.
4. Polar bear fur is actually _____ in color.
5. Polar bears spend over 50% of their time _____.
6. Climate _____ is the cause of the disappearing sea ice in the Arctic.
7. Shrinking sea _____ is threatening the survival of polar bears.
8. An adult polar bear paw is about the size of a dinner _____!
9. Polar bears evolved from _____ bears less than 500,000 years ago.
10. Polar bears have an excellent sense of _____.
11. The color of polar bear skin.
12. Polar bear fur appears white because it _____ sunlight.
13. When polar bears are first _____, they're the size of a guinea pig.
14. Polar bears have a third _____, which is used for protection.
15. Polar bears' favorite food.
16. The region where polar bears live.
17. Polar bears can detect seals in the water under three feet of _____.

- _____ **S** _____
- _____ **A** _____
- _____ **V** _____
- _____ **E** _____
- _____ **T** _____
- _____ **H** _____
- _____ **E** _____
- _____ **P** _____
- _____ **O** _____
- _____ **L** _____
- _____ **A** _____
- _____ **R** _____
- _____ **B** _____
- _____ **E** _____
- _____ **A** _____
- _____ **R** _____
- _____ **S** _____



WILD CLASSROOM

POLAR BEARS



POLAR BEAR WORD PUZZLE | ANSWER KEY

Complete the puzzle with words related to polar bears. Use your polar bear fact sheet to help you.

1. Polar bears keep their fur clean to help _____ heat.
2. Polar bears are classified as marine _____.
3. The extinction status of polar bears.
4. Polar bear fur is actually _____ in color.
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16. The region where polar bears live.
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I N S U L A T E

M A M M A L S

V U L N E R A B L E

C L E A R

H U N T I N G

C H A N G E

I C E

P L A T E

B R O W N

S M E L L

B L A C K

R E F L E C T S

B O R N

E Y E L I D

S E A L S

A R C T I C

S N O W

**Learning Activity:****Paw to Paw**

Activity Type	Arts and crafts
Focus Areas	Arts education, science
Time Required	30–45 minutes to create, 30–45 minutes to dry

Overview

It is truly an awe-inspiring moment to be in close proximity to a polar bear and witness the true scale of its size. Not only have the polar bear's height and weight contributed to its role as a top predator of the Arctic, but its enormous paws and other attributes are also adaptations for its harsh environment. In this activity, students will learn about the bear's distinctive features that help it survive in the Arctic and will create molds of their own hands to compare with a polar bear's paws. If technology is available, students can use the [WWF Together app](#) to listen as one expert describes his encounter with this massive creature.

Objective

At the completion of the activity, students should be able to:

- Define "adaptation" and provide examples.
- Describe physical characteristics of a polar bear.
- Explain how certain traits of the polar bear have been adapted to its environment.

Subject and Standards

National Core Arts Standards

- Creating
 - Anchor Standard #2: Organize and develop artistic ideas and work.
 - Anchor Standard #3: Refine and complete artistic work.
- Responding
 - Anchor Standard #7: Perceive and analyze artistic work.
 - Anchor Standard #8: Interpret intent and meaning in artistic work.



Next Generation Science Standards

- 3-LS4-2 Biological Evolution: Unity and Diversity
 - Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
- 3-LS4-3 Biological Evolution: Unity and Diversity
 - Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

● Materials Needed

- [Polar Bear Educator's Resource Guide](#) (for background reading)
- Black pipe cleaners (2 per student)
- Scissors
- Paper plates (large dinner size, preferably without ridges along the edge, 1 per student)
- Plaster of Paris
- Water
- Mixing container and utensil (1 if teacher is mixing; 1 per student if students are mixing)
- Tongue depressors (1 per student)
- Paint (optional)





● Vocabulary

- **Adaptation:** changes to a plant or animal that make it better equipped to survive under the conditions of its environment
- **Camouflage:** to conceal by disguise
- **Habitat:** a natural environment in which plants and animals live, breed, and get their food, water, and shelter
- **Insulator:** provides protection against a loss of heat, sound, or electricity
- **Predator:** an animal that obtains food by killing and consuming other animals; one that preys, destroys, or devours
- **Prey:** an animal taken by a predator as food





Activity Procedure

Part 1: Introduction and Preparation

- Start the activity by defining “adaptation,” using the definition from the vocabulary section included in this activity. Students should understand that over time, organisms will develop varying traits that can help them survive. These could be physical traits, such as thick fur or the ability to camouflage, or behavioral traits, such as the ability to hibernate or migrate.
- Encourage students to think of examples of adaptations with which they may be familiar. It can be as simple as naming a favorite animal and thinking about what traits help it thrive in its environment. Fins, feathers, blubber, webbed feet, and sharp claws are all examples of physical adaptations because they are aspects of the animal’s physical appearance that have better enabled it to survive. A dog panting, a cactus being able to store water, a skunk being able to release scent, and an opossum playing dead are all examples of behavioral adaptations as a survival action rather than appearance.
- Using information from the “Polar Bear Fun Facts” section of the [Polar Bear Educator’s Resource Guide](#), have students brainstorm traits of polar bears that they believe may be adaptations. Remind them to consider where polar bears live. The harsh and cold Arctic habitat would not be suitable for many animals, so what makes polar bears able to survive there? Also, share with them the fact that polar bears evolved from brown bears less than 500,000 years ago. This means polar bears did not always appear white. How would evolving to have clear fur be an example of an adaptation? How would clear fur that reflects sunlight and appears white benefit a polar bear? Other polar bear adaptations include:
 - Black skin absorbs heat from the sun and keeps them warm.
 - A thick layer of body fat serves as an insulator and traps in heat.
 - Clean fur helps insulate heat.
 - An additional set of eyelids protects against glare from snow and ice.
 - Large claws and teeth help them eat seals.
 - A keen sense of smell helps them seek out seals.
- This activity will focus on the adaptation of the polar bear paws. Adult polar bear paws are about 12 inches wide, the size of a dinner plate. These huge paws help evenly distribute their weight so that they don’t fall through the sea ice. Their paws also help them swim up to six miles per hour.



Part 2: Activity

In this activity, students will make a mold of their hand within a scale model of a polar bear's paw so they can visualize just how massive the paw is compared with their hand.

- Distribute materials; each student should have scissors, two black pipe cleaners, a paper plate, and a tongue depressor. Students can begin by cutting their pipe cleaners into five pieces representing claws.
- You may choose whether to have the students mix the plaster themselves or to mix a large batch yourself to distribute among the students. If students are mixing, you will need to provide each with a small bowl or cup and a mixing utensil. Follow the 2:1 powder-to-water ratio instructions as listed on the plaster of Paris directions. You may need to use discretion when determining the correct consistency and add water or powder as needed; the plaster should be well mixed and look like a viscous paste.
- Dispense enough plaster mixture into each student's plate to cover the bottom, about 0.5–1 inch deep. Instruct students to use their tongue depressor to smooth it out as flat as possible.
- While the plaster is still wet, have students place their five claws into the mixture at the top of the plate. Then, they should firmly place their hand into the middle of the mixture for several seconds, making an impression but not pushing all the way to the bottom of the plate. Moving quickly, students need to wash their hands of plaster and use their tongue depressor to carefully write their name/initials somewhere in the clay before it starts to set.
- It's recommended that the molds sit for at least 30–45 minutes to dry, so designate an area of the room for students to leave their plates. Once the molds are dry, students will be able to peel the paper plate backing off the hardened plaster, and it will show their handprint inside a polar bear's paw print.

Part 3: Discussion and Assessment

- Recap the activity by discussing adaptations of polar bear paws and comparing them to human hands. Polar bear paws may come in handy for balancing on sea ice and hunting prey, but how do our human hands help us? What other adaptations have humans developed?
- If available, use a tablet or smartphone to download the [WWF Together app](#). Encourage students to explore the polar bear segment, which contains an interactive module describing a WWF expert's account of his close encounter with a polar bear.



● Extended Learning Options

- If time allows, students can paint or decorate their craft further.
- Explore other animals of the Arctic and their adaptations that allow them to survive in such a unique environment. Have students research traits of walrus, seals, narwhals, and whales that have been adapted over the years and proved beneficial. Information on these species can be found at <https://www.worldwildlife.org/species>.
- Start a class fundraiser to protect polar bears and other wildlife and their habitats, using WWF's online fundraising tool, Panda Nation. Learn more at pandanation.org.

● Additional Background Info

You can use the information found at the links below to enhance your discussion with the class, or you may want to share some links directly with students if you determine they are grade-level appropriate.

- **Web feature:** [WWF Featured Species: Polar Bear](#)—provides facts and information about polar bears and the Arctic, the threats they face, and how you can help save them
- **Article:** [Why do polar bears have white fur? and nine other polar bear facts](#)—answers common questions about polar bears
- **Video:** [WWF Together - Polar Bears](#)—a short advertisement for the WWF Together app that contains facts and interactives about polar bears
- **Video:** [Playful baby polar bear - WWF Symbolic Adoption Video](#)—a clip showing a mother polar bear and her cub in the wild
- **Video:** [Sounds of the Bering Sea](#)—plays sounds recorded when a GoPro is held underneath the surface of the Bering Sea and picks up an underwater chorus of Arctic species

For more fun classroom activities with a focus on wild species and conservation, visit wildclassroom.org.



Learning Activity:

My Day on Patrol

Activity Type	Reading and writing
Focus Areas	Language arts, social studies
Time Required	30–45 minutes

● **Overview**

The climate and environment of the Arctic present challenges that many cannot imagine, yet 4 million people and a variety of animals, including polar bears, call the Arctic home. In order to maintain harmony among this diverse group of residents, scientists from WWF and local townspeople have combined efforts to assemble polar bear patrol teams. These teams help generate ideas and implement tactics to prevent dangerous or undesirable encounters between polar bears and people. In this activity, students will read an excerpt from a journal kept by a biologist reporting from one such project. Students will imagine that they are members of the polar bear patrol team and compose a journal entry describing the team’s studies in the Arctic.

● **Objective**

At the completion of the activity, students should be able to:

- Describe characteristics of the Arctic environment and the challenges they pose to everyday living.
- Use creative writing skills to generate a journal entry containing factual details about polar bears and the Arctic.
- Learn more about environmental science careers working in the field.





● Subject and Standards

Common Core Standards: English Language Arts

- L. 3.3/4.3/5.3: Use knowledge of language and its conventions when writing, speaking, reading, or listening.
- L. 3.4/4.4/5.4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 3/4/5 reading and content, choosing flexibly from a range of strategies.
- RF. 3.3/4.3/5.3: Know and apply grade-level phonics and word analysis skills in decoding words.
- RF. 3.4/4.4/5.4: Read with sufficient accuracy and fluency to support comprehension.
- RI. 3.1: Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
- RI. 4.1: Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- RI. 3.4/4.4/5.4: Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3/4/5 topic or subject area.
- W. 3.2/4.2/5.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- W. 3.3/4.3/5.3: Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.
- W. 4.9/5.9: Draw evidence from literary or informational texts to support analysis, reflection, and research.

C3 Framework for Social Studies State Standards

- D2. Geo.2.3-5: Use maps, satellite images, photographs, and other representations to explain relationships between the locations of places and regions and their environmental characteristics.
- D2. Geo.4.3-5: Explain how culture influences the way people modify and adapt to their environments.
- D2. Geo.10.3-5: Explain why environmental characteristics vary among different world regions.



● Materials Needed

- [Polar Bear Educator's Resource Guide](#) (for background reading)
- Copies of the [Expedition Diary](#) (short excerpt included at the end of this activity)
- Paper/journals
- Writing and coloring utensils

● Vocabulary

- **Climate change:** a change in climate over time due to natural causes or as a result of human activity
- **Indigenous:** produced, growing, living, or occurring naturally in a particular region or environment
- **Tundra:** treeless areas of the Arctic covered in snow and shrubby plants for much of the year
- **Wetland:** a place where the land is covered by water, either salt, fresh, or somewhere in between, including marshes, ponds, the edge of a lake or ocean, the mouth of a river, etc.

● Activity Procedure

Part 1: Introduction and Preparation

- Provide students with background information on the geography of the Arctic and on the people who call the region home. You can choose to review this information as part of a group discussion or provide it as a handout for students to read.
 - The region known as the Arctic comprises eight countries (United States, Canada, Greenland, Iceland, Norway, Sweden, Finland, and Russia) and various bodies of water, including the Arctic Ocean and the Bering, Beaufort, and Chukchi Seas.
 - The climate and environment of the Arctic are unlike those of any other region. In addition to the surrounding bodies of water, it also spans diverse landscapes—from sea ice to coastal wetlands, upland tundra, and mountains with winter temperatures reaching -40°F or colder.
 - There are approximately 4 million people currently living in the Arctic, many of whom are indigenous residents who have lived off the land, hunting animals for food, clothing, and other essentials, for generations.



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- Challenge students to expand the discussion to ways the people of the Arctic would be affected by climate change. Some of this information can be found in the “Threats Polar Bears Face” section of the [Polar Bear Educator’s Resource Guide](#). How would a changing climate disrupt their way of life, considering that so much of their livelihood is dependent on the land and animals?
 - One of the most significant problems caused by climate change in the Arctic is the loss of sea ice. Average temperatures are continuing to increase, resulting in diminishing sea ice. Polar bears depend on sea ice for their survival; it serves as feeding, resting, and breeding grounds for them. With less sea ice available, polar bears are forced to relocate and end up spending more time on land. As the bears search for food, they are more likely to come into closer proximity to towns, leading to more frequent confrontations with local people.
- In 2006, WWF supported the establishment of the Umky (polar bear) Patrol on the coast of the Chukchi Sea in the Russian Far East. Today, there are more than a dozen polar bear patrols across multiple countries. These patrols consist of local community members passionate about helping keep polar bears and humans safe. Their main objective is to provide routine surveillance of wildlife around their region, including polar bears, whose behavior can be unpredictable due to the loss of their sea ice habitat, which causes them to spend more time on shore. In order to protect bears and the townspeople, these patrol teams monitor polar bear movements, alert villagers of approaching bears, and take action to drive away any bears that wander near villages. These protective measures could include the use of snowmobiles, air horns, or other noisemakers to steer polar bears away from the town. Patrols also work to reduce accessible protein near towns by relocating washed-up walrus and/or whale remains that might stimulate the bears’ keen sense of smell. In addition, the teams educate townspeople on the use of outdoor bear-proof food storage containers to avoid attracting bears. The patrol teams aim to improve lighting in villages where children are walking to school, encourage the establishment of a designated place for people to congregate in safety, and connect local experts with communities to share their knowledge about bear behavior so residents may be better prepared for a potential encounter.





Part 2: Activity

In this activity, students will read excerpts from the journal of a scientist working with a polar bear patrol in the Arctic. They will then compose their own writing sample as if they were part of a patrol, documenting their mission to protect these members of the Arctic community.

- Distribute copies of the [Expedition Diary](#) article to students. This was written by Tom Arnbom, a Swedish biologist, while in Chukotka, Russia, with WWF's Umky Patrol project. It should be noted that English is not Tom's primary language, so some of his journaling may reflect this. His descriptive accounts offer insights into life in the Arctic, while he narrates the patrol team's efforts to track polar bears. You may choose individual passages or have students read the passage in its entirety. A short excerpt is included at the end of this activity, or you may follow the link to the full article. Students may read independently or take turns reading sections of the diary aloud in groups.
- Have students summarize the reading, by recalling and discussing details of what they read. They should be able to describe the unique living conditions in the Arctic and some of the challenges, while providing examples of what polar bear patrol teams do.
- Students will now combine what they learned from the reading and their creative writing skills in their own journal entry. Encourage them to use descriptive vocabulary so the reader can easily imagine the setting. They should also incorporate factual information regarding their mission as a member of a polar bear patrol team.

Part 3: Discussion and Assessment

- Allow students to present their completed journal entry, if desired.
- Show the video [WWF - Polar bear conflict](#), which follows WWF scientists into the Arctic, looking at why human and polar bear encounters have increased and measures the patrols are taking to avoid them. After watching the video, quiz students on some of the strategies implemented.
- Recap and review with students why it's important to have polar bear patrol teams. This information can be found in the "Threats Polar Bears Face" and "How WWF Is Helping Polar Bears and the Arctic" sections of the [Polar Bear Educator's Resource Guide](#).



● Extended Learning Options

- After students read the [Expedition Diary](#), have them create an illustration of the Arctic based on the author's vivid description of the setting. Or if you prefer, they can create an illustration to accompany their own journal entry or that of another classmate's.
- Engage students in a discussion about whether or not they'd want to be a member of a polar bear patrol team. Provide them with a copy of WWF Program Officer [Elisabeth Kruger's biography](#), or display on screen to read aloud as a class. Elisabeth works in the Arctic, studying climate change and polar bears. This will give students a glimpse into the work behind such a unique field of science. Challenge them to consider other careers that help protect wildlife and their habitat.
- If available, use a tablet or smartphone to download the [WWF Together app](#). Encourage students to explore the polar bear segment, which contains interactive modules that mention other WWF actions that help protect this iconic species.
- Start a class fundraiser to protect polar bears and other wildlife and their habitats, using WWF's online fundraising tool, Panda Nation. Learn more at [pandanation.org](#).





● Additional Background Info

You can use the information found at the links below to enhance your discussion with the class, or you may want to share some links directly with students if you determine they are grade-level appropriate.

- **Article:** [An Arctic village prepares for a furry impact](#)—a short reading on polar bear movement due to climate change
- **Video:** [The Umky Patrol](#)—provides background on the formation of polar bear patrol teams that help avert conflict between polar bears and people of the Arctic
- **Video:** Video: [A village in Greenland and its growing threats from polar bears](#)—shows how receding sea ice is causing polar bears to move into town, and what WWF is doing to help
- **Article:** [WWF's Elisabeth Kruger on polar bears, climate change, and indigenous communities](#)—Kruger leads WWF's efforts to help polar bears and other Arctic marine mammals coexist alongside people in an increasingly warmer and ice-free Arctic
- **Article:** [One Arctic town's very busy polar bear patrol](#)—outlines what it's like being part of a polar bear patrol team, working to keep polar bears and humans safe
- **Video:** [WWF's Elisabeth Kruger Reports Live from the Bering Strait](#)—WWF's resident polar bear expert, Elisabeth Kruger, says hello from the shores of the Bering Strait in Wales, Alaska



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● Expedition Diary: Tom Arnbom in Chukotka, Russia



Tom Arnbom, a Swedish biologist, reports directly from WWF's Umky Patrol project in Vankarem, Chukotka, northeast Russia. Tom's blog offers fascinating insights into life in an extremely remote region of the world while following the work of the Umky Patrol, i.e., the WWF Polar Bear Patrol team.

3rd December: Polar bear tracks and open sea

It stopped raining during the night; the temperature is still above freezing, but the wind is much harder than yesterday. It feels like the wind gets hold of the house and shakes it all night. Despite the "bad" weather, the polar bear patrol heads out to check some feeding points. A raven passes by between the buildings while we come out of the door. At the first feeding point, a white Arctic fox runs away. At the next place, nothing. Vlad Kavry then decides that we should go along the coast to the west; there is a chance that we will see a polar bear.



On patrol for polar bears in north-eastern Russia.

The ocean is dark and totally open; just a few days ago it was covered with ice, all the way to the horizon. We drive 10–20 meters from the water's edge, so we do not miss any bears. When ice covered the ocean, there was not a single bird present, but today bird species like glaucous gulls,



POLAR BEARS

ivory gulls, and Ross gulls pass by. For many birders, it is a dream to see the last species [Ross gulls], an Arctic and pinkish bird, and today I observed a minimum of 2,000 Ross gulls migrating towards the Bering Strait!

Along the beach there is a rusty container. Vlad Kavry, the chief commander of today's polar bear patrol, tells me that last year a poacher had put some bait in the container to lure polar bears, which then were supposed to be shot illegally. Of course, the patrol took away all the meat in the container. We continue our Ski-Doo trip, suddenly Vlad stops and jumps off. He points at some very large footprints in the snow—umky, he says, i.e., polar bear in native tongue. After ten days, we get at last to see a sign that there are polar bears in the area. Only a few kilometers later, the next polar bear track turns up. It is only a few days old. The footprints are twice the size of my winter boots—on some occasions you feel very small, and



The Polar Bear Patrol watch a large male polar bear about 200 metres away.

that is what I do just now. Sadly we had to turn around, while it is getting dark. We find a Ski-Doo track which continues along the coast towards west, and Vlad is worried that it is a poacher. The patrol does have a purpose.

The strong southeastern wind is probably breaking up the newly formed sea ice on the southern side of Wrangel Island. This means that the bears on Wrangel Island cannot get ashore on the mainland, where we are. There is most likely sea ice further out to the west, and it is a bit worrying if the bears head out on the ice and wander off to the southwest. They will then end up close to two settlements, which are renown for poaching. If so, many bears might be killed.



WILD CLASSROOM

POLAR BEARS

The lack of sea ice along the coast of Chukotka means that few, if any, female polar bears will give birth on the mainland this year. Normally, somewhere around 20 females build winter dens along the coast. They should already be in their dens, while the cubs are born around New Year's. There is no problem for the females stranded at Wrangel Island. But if there are any females out on the pack ice that do not reach Wrangel in time, they then have to give birth on the sea ice, and there it is pretty hard to dig a protective and insulated den for the newborn. When I see the ice chart over Svalbard, I am shocked. The pack ice is far away from the landmass, and if the ocean does not freeze soon, there will be a problem for the pregnant females. They have three choices. Either quickly wander off to the west and reach Greenland or Jan Mayen, or head east to islands in Russia. The third option is to give birth on the sea ice, which is possible, but the survival rate of the newborn probably drops dramatically.

4th December: Polar Bear

Finally, after ten days, we succeed. This might be my last day here at the northern coast of Chukotka. The flight is scheduled for tomorrow, but it all depends on what kind of weather we get within the next 20 hours. There were no plans to get out today, but it is fantastic outside. Clear sky, not a single breath of wind, and about 0°C—in other words,



A member of a Russian Polar Bear Patrol warns off a polar bear.

like a day in early May. At ten, Vlad Kavry cannot stand it anymore and says let's go out with the polar bear patrol. So with short notice we are out on the Ski-Doo heading east along the coast. We have not even left Cape Schmidt when some very large footprints appear, and they go almost straight in among the houses. Where is the bear now? Around the next corner or nobody knows?



WILD CLASSROOM

POLAR BEARS

We decide to continue to the east. Kilometer after kilometer, we pass numerous carcasses of dead walruses. I realize there must be more food than usual, which is served for the polar bears and the Arctic fox. Further on, a flock of birds flies away when we approach. They were sitting on a half-eaten walrus, and there are many footprints around it from a relatively small polar bear. But no sign of a live wild polar bear. Along the coast, there are many ivory gulls and Ross gulls, which are heading towards the Bering Strait, and close to shore there are several ringed seals.

We stop to get a better view from a small hill. Vlad looks at me and smiles. There, far, far away, a light-yellow furry thing is eating. This is what we have been waiting for—a wild polar bear. We try to get a bit closer, but the bear sees us, and it dashes for the sea and swims away. Despite the fact that bears have been protected for more than 50 years in Russia, this bear is really afraid of us. Vlad Kavry, the local leader for the polar bear patrol, divides the bears into four categories: the skittish ones which take off for nothing, the curious which get closer to have a look, the aggressive ones, and finally the bears which totally ignore humans. Sadly, we met a scared one. We depart from the site so we do not disturb anymore. During the last two days we have been lucky to encounter footprints from five different polar bears around Cape Schmidt. I wonder how it is when all the several hundred bears find their way from Wrangel Island to the mainland, and start to migrate east. When we discuss this, Vlad turns to me and says, “This is the first time I really wonder if the winter will come.” Yesterday, it rained, and hundreds of polar bears are missing; what is happening?



Learning Activity:

Climate Trackers

Activity Type	Developing models and interpreting data patterns
Focus Areas	Science, social studies
Time Required	60–90 minutes

● Overview

To fully understand the significance of climate change in the Arctic, you must first understand climate. This activity will establish student comprehension of climate and how it’s connected to their local way of life. By creating climate timelines, they will be able to visualize the domino effect of negative implications caused by climate change and how those effects are felt all around the world.

● Objective

At the completion of the activity, students should be able to:

- Define weather and climate and how they differ.
- Explain how a region’s climate plays a role in livelihoods within the community and environment.
- Predict the future of Arctic sea ice based on climate models and trends.
- Make the connection between the effects of climate change in the Arctic and local peoples’ everyday lives.

● Subject and Standards

Next Generation Science Standards

- 3-ESS2-1 Earth’s Systems
 - Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
- 3-ESS2-2 Earth’s Systems
 - Obtain and combine information to describe climates in different regions of the world.



C3 Framework for Social Studies State Standards

- D2. Geo.2.3-5: Use maps, satellite images, photographs, and other representations to explain relationships between the locations of places and regions and their environmental characteristics.
- D2. Geo.3.3-5: Use maps of different scales to describe the locations of cultural and environmental characteristics.
- D2. Geo.5.3-5: Explain how the cultural and environmental characteristics of places change over time.

Materials Needed

- Markers/writing utensils
- Sticky notes (4 different colors)
- Large paper/poster, 1 per student/group
- Copies of "Arctic Events" (included in this activity), 1 per student/group
- Scissors/glue stick (optional), 1 per student/group
- Computer access
- [Polar Bear Educator's Resource Guide](#) (for background reading)

Vocabulary

- **Climate:** the average condition of the weather at a place, usually over a long term, as exhibited by temperature, wind velocity, and precipitation
- **Climate change:** a change in climate over time due to natural causes or as a result of human activity
- **Fossil fuels:** formed from fossilized remains of prehistoric organisms (most common are coal, oil, and natural gas) and burned to generate energy; the biggest drivers of climate change
- **Greenhouse gases:** gases such as water vapor, carbon dioxide, methane, and nitrous oxide; they absorb some of the sun's heat energy and trap it in the atmosphere, making Earth warmer
- **Positive climate feedback loop:** a cycle that accelerates a temperature rise and an overall warming trend
- **Weather:** the state of the atmosphere with respect to heat or cold, wetness or dryness, calm or storm, clearness or cloudiness



POLAR BEARS

● Activity Procedure

Part 1: Introduction and Preparation

- Begin by asking students to give examples of weather. Now ask them to give examples of climate. Many students will be puzzled as to what differentiates the two. Use the definitions provided in the vocabulary section of this activity to help clarify this common misunderstanding. Climate is often defined as the weather pattern that is expected, or the long-term average weather conditions during that time of year in that specific location; weather is the short-term weather conditions or what you actually get each day. If desired, display this information and examples on the board for students to visualize.
 - For example, climate in the northeastern area of the United States in January would be expected to be cold and snowy. The weather might be 20 degrees and stormy.
 - To help students understand, you could also say weather determines if you wear a sweater or a T-shirt. Climate determines how much insulation your house should have in the walls and attic.
- Draw four columns on the board with the name of a different season at the top of each column, leaving plenty of space under the columns. Have students provide you with words to describe the climate during each season in your area, writing each word in the appropriate column. When finished, draw a horizontal line to separate those examples from the next step. For example:

	FALL in my area	WINTER in my area	SPRING in my area	SUMMER in my area
Climate	chilly cloudy cool	cold snowy icy	warm windy rainy	hot dry humid
Event				



POLAR BEARS

- Divide the students into four groups and assign each group a season (fall, winter, spring, or summer). Give each group a stack of sticky notes (a different color for each).
- Instruct the students to think of as many things as they can that take place during their assigned season where they live. These could be activities they participate in, events in the town, behaviors of plants or animals, or anything they recall primarily occurring during their season. They should write one event or activity per sticky note (with no repeats). For instance, depending on where you live, the group assigned summer could write examples such as pools open, they go on vacation, or there are more bugs present.
- Once time has expired, instruct one group at a time to place their sticky notes in the space provided beneath the climate words in their season's column.
- Take a few moments to read aloud the examples on the sticky notes and reflect with the students on what they created. Do any of the activities/events on their timeline depend on the climate? Would that activity/event happen during that same time of year if the climate were totally different?
- To better imagine, pick one season and erase the climate words. Instead, write in words that describe the climate as being much different. A great example would be for winter, to instead write words similar to that of spring or summer. Now reread the activities the winter group came up with. Are there any listed that no longer fit and would now be unlikely to happen? If so, remove the sticky note and move it to the season where students think it would better fit.





POLAR BEARS

Part 2: Activity

Now that students have an introduction to climate and its role in the existence of other livelihoods, they will apply the concept to the Arctic to uncover the magnitude of the effects of climate change.

- You can choose to have students work individually or in groups. Give each student/group a large piece of paper. Replicating the previous class activity, students will start by making a chart with the seasons at the top and describing the climate under each as it relates to the Arctic. You can review this information verbally or have it available to students on a handout or visual.
 - There are two main seasons that exist in the Arctic: the summer and the winter. The winter in the Arctic is the predominant season, usually lasting from September through March. It is extremely cold, and the landscape is very snowy and icy. The temperature increases during the summer months of April through August, and the landscape reveals much more terrain (grassy).
- After they have completed the climate section of their chart, students will then be tasked with sorting various events that take place in the Arctic according to the season in which they would likely occur. These events are listed with descriptions at the end of this activity. You may choose to print out these events and have students cut and paste them into their chart, or simply write them in using the handout as a reference. When determining each event’s place in their chart, students should consider the nature of the activity and the Arctic climate it would need to take place.

	SUMMER in the Arctic	WINTER in the Arctic
Climate	short warmer dry grassy	long very cold snowy icy
Event	Sea ice melts Ocean drilling for oil/gas Shipping traffic Walrus haul out Tourist season Fishing season	Sea ice forms Polar bear breeding Polar bear feeding Seal breeding/nursing



- Once students have finished, review the Arctic events together and have them share how they categorized each. How did they determine when these events would typically occur? Have students answer the following conclusion questions. You may choose to have the questions as a handout assignment or as a class discussion.
 - What does sea ice have to do with events or activities in the Arctic?
 - What do you think happens when the climate changes and there are fewer months when sea ice exists (the winter gets shorter, summer gets longer)? Who would be affected, and how?
 - How does/will climate change affect you?

Part 3: Discussion and Assessment

- Show this time-lapse video from NASA, [Yearly Arctic Sea Ice Age: 1984–2016](#), which shows changing sea ice cover in the Arctic. Have students explain what they're watching. Where is it? What is being depicted? The video shows the average amount of sea ice in the Arctic over the span of approximately 30 years. Encourage students to describe any trends or patterns they notice in the video.
- Explain to students that the climate is changing and temperatures are increasing due to human-induced impacts (you may choose to reference climate change terms from the vocabulary section of this activity). The Arctic and its unique environment are particularly affected; this region is warming twice as fast as the rest of the planet. This is due to the positive feedback loop. Light colors reflect sunlight, and dark colors absorb sunlight. This same concept applies to sea ice. Sea ice (a light color) is able to reflect sunlight back into the atmosphere, while oceans (dark) absorb it. When there is less sea ice, more sunlight gets absorbed into the ocean, causing increasing water temperatures. The warmer water temperatures, in turn, continue to melt sea ice. As long as climate change persists at the current rate, this cycle of increasing temperatures and disappearing sea ice will continue to generate the changing patterns that students uncovered during the activity.
 - In addition, the devastating effects of climate change in the Arctic are felt around the world. As glaciers and sea ice continue to melt, sea levels rise, threatening shorelines everywhere. Rising sea levels contribute to erosion on beaches and could eventually leave many coastal towns underwater.
- Have students generate ideas about how their area and lives are and will continue to be affected and what they can do to help. This information can be found in the "What Kids Can Do" section of the [Polar Bear Educator's Resource Guide](#).



● Extended Learning Options

- Using maps of the Arctic, have students make predictions as to how much sea ice coverage will exist in the future based on current trends.
- If available, use a tablet or smartphone to download the [WWF Together app](#). Encourage students to explore the polar bear segment, which contains interactive modules outlining the difficulties that arise from decreasing sea ice.
- Start a class fundraiser to protect polar bears and other wildlife and their habitats, using WWF's online fundraising tool, Panda Nation. Learn more at [pandanation.org](#).

● Additional Background Info

You can use the information found at the links below to enhance your discussion with the class, or you may want to share some links directly with students if you determine they are grade-level appropriate.

- **Video:** [Climate Change & Arctic Warming](#)—outlines how the melting of the Arctic region is affecting species
- **Article:** [Polar Bears and Climate Change](#)—a short overview of how polar bear populations are affected by climate change
- **Article:** [Record low sea ice impacts polar bears](#)—a WWF researcher's firsthand account witnessing the effects of climate change on polar bears
- **Web feature:** [How big is the Arctic Ocean? And eight other Arctic facts](#)—nine Q&As about why the Arctic is important
- **Article:** [Lack of winter sea ice disrupts life in the Arctic](#)—impacts of one of the lowest-recorded yearly levels of sea ice in the Arctic
- **Article:** [Climate change puts the Pacific walrus population on thin ice](#)—how the receding sea ice in the Arctic is impacting walruses
- **Article:** [Why are glaciers and sea ice melting?](#)—outlines the effects melting glaciers and sea ice have on species and communities around the world

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● Arctic Events

SEA ICE FORMS

When sea ice freezes and covers large areas of the Arctic

SEA ICE MELTS

When sea ice melts and retreats

POLAR BEAR BREEDING

Polar bears gather on sea ice to mate

POLAR BEAR FEEDING

Polar bears patiently hunt for seals off of sea ice

SEAL BREEDING/NURSING

Seals stay on sea ice to give birth to and nurse their pups

OCEAN DRILLING FOR OIL AND GAS

Less sea ice means more open areas to drill deep below for oil and gas

SHIPPING TRAFFIC

With less sea ice, there's more room for ships to navigate through Arctic waters

WALRUS HAUL OUT

Large groups of walrus gather on the shore when sea ice melts, many times hurting each other in the process

TOURIST SEASON

Less sea ice provides more room for cruise ships to travel through the Arctic, allowing people to visit

FISHING SEASON

The Arctic has 4 of the world's top 10 major fisheries and the world's appetite for fish continues to grow



POLAR BEARS

Learning Activity:

What's the Connection?

Activity Type	Modeling cause and effect
Focus Areas	Science, social studies
Time Required	45–60 minutes

● Overview

In a rapidly modernizing world, our dependence on energy continues to grow with the population. Unfortunately, the widespread generation of power from some sources comes at a high cost. Students will explore the connection between how the world's energy use can affect a polar bear's survival, by creating chain-link models. This will demonstrate the cause-and-effect relationships of climate change and its impact on the Arctic environment. Through this activity, students will learn how their actions, both positive and negative, can impact areas and species in faraway places.

● Objective

At the completion of the activity, students should be able to:

- Define vocabulary related to energy and climate change.
- Name examples of energy and describe how it is transferred.
- Relate our energy use to declining polar bear populations.
- Identify alternative behaviors that could help fight climate change and reduce the risks to polar bears and other species.





● Subject and Standards

Next Generation Science Standards

- 4-ESS3-1 Earth and Human Activity
 - Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
- 5-ESS3-1 Earth and Human Activity
 - Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.
- 5-PS3-1 Energy
 - Use models to describe that energy in animals’ food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun.

C3 Framework for Social Studies State Standards

- D2. Eco.1.3-5: Compare the benefits and costs of individual choices.
- D2. Eco.3.3-5: Identify examples of the variety of resources (human capital, physical capital, and natural resources) that are used to produce goods and services.

● Materials Needed

- [Polar Bear Educator’s Resource Guide](#)
- Strips of paper large enough to write on and glue together (construction paper recommended)
- Pen or pencil
- Glue sticks
- Copies of the “My Energy Saving Plan” student worksheet included in this activity (optional)
- Copies of puzzle included in this activity (optional)
- Tape (optional)



● Vocabulary

- **Climate change:** a change in climate over time due to natural causes or as a result of human activity
- **Energy:** the capacity (as of heat, light, or running water) for doing work
- **Fossil fuels:** formed from fossilized remains of prehistoric organisms (most common are coal, oil, and natural gas) and burned to generate energy; the biggest drivers of climate change
- **Greenhouse gases:** gases such as water vapor, carbon dioxide, methane, and nitrous oxide; they absorb some of the sun's heat energy and trap it in the atmosphere, making Earth warmer
- **Habitat:** a natural environment in which plants and animals live, breed, and get their food, water, and shelter
- **Nonrenewable resource:** resource that cannot be replaced (at the same rate) after it is used (examples are coal, oil, and natural gas)
- **Positive climate feedback loop:** a cycle that accelerates a temperature rise and an overall warming trend
- **Renewable resource:** resource that can be replaced by nature (examples are solar, wind, water)
- **Turbine:** an engine that consists of a series of blades spun around by the pressure of a fluid (such as water, steam, or air)





● Activity Procedure

Part 1: Introduction and Preparation

- For this activity, students should know the basics of energy. Energy can be found anywhere there is motion, light, heat, or sound. Energy can come in many forms and can continuously change form. Have students brainstorm things they use or things they do every day that require energy. Examples could include using the bus to get to school, playing sports, or watching television.
- Now ask students where that energy comes from. All energy begins with the sun; however, that energy will go through many different transitions before becoming a different form of power. Provide and display relatable examples that will challenge students to trace energy conversions. Since so many commonly used devices require electricity, an easy example to relate to students might be something they plug in to use:

– Turning on a lamp in your house → electricity → burning coal → plants/animals → sun

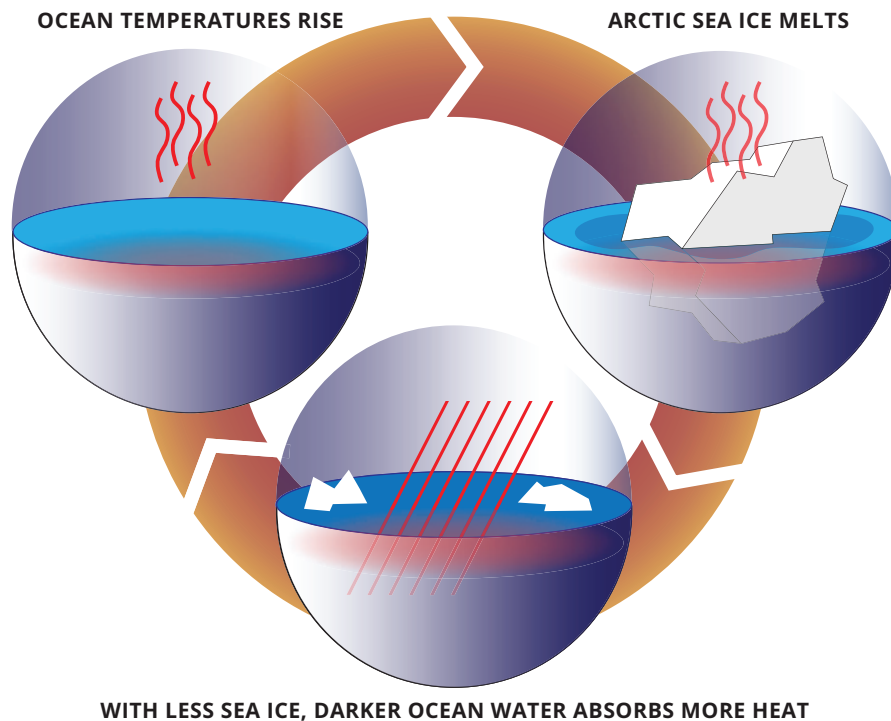
- To turn on the lamp, you need to plug it into the electrical outlet in your house. Electricity is often generated by burning coal to power a turbine that sends the electrical energy to your neighborhood. Coal has stored energy that was formed over millions of years by combining heat and pressure with fossilized plant and animal matter, which originally derived their energy from the sun.





POLAR BEARS

- Unfortunately, many ways humans process energy are negatively impacting our planet. Discuss the process of climate change, using the definitions provided in the vocabulary section of this activity and the following information:
 - Greenhouse gases, such as carbon dioxide, trap heat in the atmosphere and regulate our climate. These gases exist naturally, but humans can impact their levels, such as by adding more carbon dioxide by burning fossil fuels for energy (coal, oil, and natural gas) and by clearing forests (the stored carbon dioxide inside of trees gets released into the atmosphere when the trees are cut down). Greenhouse gases act like a blanket. The thicker the blanket, the warmer our planet becomes.
 - The release of greenhouse gases from the burning of fossil fuels and other sources is causing temperatures in the Arctic to warm at twice the rate of the rest of the world.
 - In the Arctic, the warmer ocean temperature is causing more sea ice to melt. With more sea ice melting, the Arctic is experiencing a positive climate feedback loop.
 - Arctic sea ice and snow reflect a lot of the sun's energy back into space. This helps prevent the Earth from becoming overheated. As humans release more greenhouse gases into the atmosphere, water temperatures rise and more sea ice melts, opening up more ocean water. The dark water of the ocean, instead of reflecting the sun's energy like ice does, absorbs the energy, which causes temperatures to continue to rise and more sea ice to melt.





- Using polar bears as an example, discuss with students what kind of ripple effects this continued loss of sea ice would have on members of the Arctic community. Polar bears rely on sea ice for their survival; it is where they rest, breed, and feed. With sea ice levels continuing to diminish, polar bears are losing their habitat and are at risk of extinction.

Part 2: Activity

In this activity, students will create cause-and-effect chains that show how their energy use can connect with climate change impacts affecting the polar bears and their environment.

- Assess student understanding by having them summarize in their own words the causes of climate change and its effects on sea ice.
- Have students work individually or in pairs, and give them strips of paper and a glue stick. They will be forming interconnected links that start with something they use that requires energy and end with impacts to polar bears. In their chain, they should create as many links as they need, but encourage them to try and include at least five. It may be helpful for them to write their steps out on a scrap piece of paper first.
- For their first link, students should write one item they use that requires energy. Examples include television, video games, lights, and cars. The next link in their chain should be where that device gets its energy. Students will continue to trace it back, thinking of cause and effect, and including links relating to climate change such as the burning of fossil fuels, greenhouse gases, the melting of sea ice, and ultimately the polar bears losing their habitat/food.

- Example:

Video games → Electricity → Burning fossil fuels → Releases greenhouse gases → Makes ocean temperatures rise → Melts sea ice → Polar bears lose their home

- When they believe their links are all in order, they will glue the strips of paper around each other, creating a chain. The first link should be glued to itself (with writing on the outside) to create a ring; each of the other links will go around the step directly before it, before it is glued.
- Once this is completed, have each individual or pair share their chain by describing the correlation between an item they use or activity they engage in and the impact on polar bears.



Part 3: Discussion and Assessment

- Review how the world’s massive appetite for fossil fuels causes climate change and has a huge effect on polar bears and the Arctic. Discuss how the world’s continuously increasing population and rising standard of living are causing an increased need for these products (electricity, fuel), which is causing the rate of climate change, and therefore the threat to polar bears, to increase. Students should recognize the cause-and-effect patterns and understand that all of these actions are related, so if things continue in this way, the outcomes will only worsen.
- As a class, discuss alternatives to satisfy the need for energy. Compare and contrast renewable and nonrenewable resources using the definitions and examples provided. Have students brainstorm the advantages of using renewable resources. Also, have them think of ways that they can avoid wasting energy. Examples include turning off lights and video games when not in use, unplugging phone and tablet chargers, and adjusting thermostats. Other examples can be found in the “What Kids Can Do” section of the [Polar Bear Educator’s Resource Guide](#).

● Extended Learning Options

- Have students complete the “My Energy Saving Plan,” included in this activity, to help stay accountable at home for saving energy and slowing climate change. Remind them that conserving energy includes not only being conscious of current practices to avoid being wasteful, but also choosing to use renewable sources. An example could include talking to members of your school or family about solar energy and its benefits.
- To help illustrate causes and effects of saving energy, print copies of the attached puzzle on paper or card stock, cut along the lines of the puzzle, and then scramble the pieces. Give each student a set of puzzle pieces, and challenge students to think of nine ways in which they or their community could reduce the amount of energy they use. Ideas could be something like riding their bike instead of driving in a car, unplugging devices such as computers when not in use, or installing solar panels. After each student has come up with nine ideas, have them write each idea on the back of the puzzle pieces. Once this is done, have the students put the puzzle together and tape it into place. The image—a polar bear living happily amid plentiful amounts of sea ice—represents the effect.



- If available, use a tablet or smartphone to download the [WWF Together app](#). Encourage students to explore the polar bear segment, which contains interactive modules to help them better visualize the impacts of climate change on polar bears.
- Start a class fundraiser to protect polar bears and other wildlife and their habitats, using WWF's online fundraising tool, Panda Nation. Learn more at [pandanation.org](#).

Additional Background Info

You can use the information found at the links below to enhance your discussion with the class, or you may want to share some links directly with students if you determine they are grade-level appropriate.

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- **Article:** [Record low sea ice impacts polar bears](#)—a WWF researcher's firsthand account witnessing the effects of climate change on polar bears
- **Video:** [Remember when?](#)—touching segment on the importance of nature conservation
- **Article:** [Lack of winter sea ice disrupts life in the Arctic](#)—impacts of one of the lowest-recorded yearly levels of sea ice in the Arctic
- **Article:** [Climate change puts the Pacific walrus population on thin ice](#)—how the receding sea ice in the Arctic is impacting walruses
- **Article:** [Why are glaciers and sea ice melting?](#)—outlines the effects melting glaciers and sea ice have on species and communities around the world



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POLAR BEARS

Name: _____

● MY ENERGY SAVING PLAN

Using what you've learned about how using energy impacts polar bears, think of as many ways you can to save energy at your home or school. Make a checklist of ways you can save energy, and post this list somewhere you will see it each day to remind you!

To save energy and help polar bears, I will...

- 1) _____

- 2) _____

- 3) _____

- 4) _____

- 5) _____

- 6) _____

- 7) _____





POLAR BEARS

Learning Activity:

Arctic Defense Team

Activity Type	Research and persuasive argumentation
Focus Areas	Social studies, language arts
Time Required	30–45 minutes

● Overview

One of the most highly debated environmental topics today is the oil industry's presence in the Arctic. This region contains fragile ecosystems that would be devastated if an oil spill were to occur, and the industry's presence would greatly alter the livelihood and traditions of the local communities. This activity asks students to work together to generate solid, evidence-backed reasons why drilling in this region is not a good idea and to suggest alternatives that best meet the needs of all parties involved.

● Objective

At the completion of the activity, students should be able to:

- Describe the types of principles that are reflected in a successful governmental unit.
- Define the challenges that exist when defending an argument to establish new rules.
- Explain various negative outcomes of oil drilling in the Arctic and propose alternative solutions.





● Subject and Standards

C3 Framework for Social Studies State Standards

- D2. Civ.2.3-5: Explain how a democracy relies on people's responsible participation, and draw implications for how individuals should participate.
- D2. Civ.3.3-5: Examine the origins and purposes of rules, laws, and key US constitutional provisions.
- D2. Civ.6.3-5: Describe ways in which people benefit from and are challenged by working together, including through government, workplaces, voluntary organizations, and families.
- D2. Civ.7.3-5: Apply civic virtues and democratic principles in school settings.
- D2. Civ.8.3-5: Identify core civic virtues and democratic principles that guide government, society, and communities.
- D2. Civ.9.3-5: Use deliberative processes when making decisions or reaching judgments as a group.
- D2. Civ.10.3-5: Identify the beliefs, experiences, perspectives, and values that underlie their own and others' points of view about civic issues.
- D2. Civ.11.3-5: Compare procedures for making decisions in a variety of settings, including classroom, school, government, and/or society.
- D2. Civ.12.3-5: Explain how rules and laws change society and how people change rules and laws.
- D2. Eco.2.3-5: Identify positive and negative incentives that influence the decisions people make.
- D2. Eco.3.3-5: Identify examples of the variety of resources (human capital, physical capital, and natural resources) that are used to produce goods and services.

Common Core Standards: English Language Arts

- L. 4.3: Use knowledge of language and its conventions when writing, speaking, reading, or listening. Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion).
- SL. 3.1/4.1/5.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3/4/5 topics and texts, building on others' ideas and expressing their own clearly.
- SL. 5.4: Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.



● Materials Needed

- [Polar Bear Educator's Resource Guide](#)
- Paper
- Pencil
- Internet access for student groups

● Vocabulary

- **Climate change:** a change in climate over time due to natural causes or as a result of human activity
- **Democracy:** a government in which the highest power is given to the people and exercised by them directly or indirectly through elected representatives
- **Economy:** the use and/or arrangement of money and goods, usually by a country or period in history
- **Fossil fuels:** formed from fossilized remains of prehistoric organisms (most common are coal, oil, and natural gas) and burned to generate energy; the biggest drivers of climate change





POLAR BEARS

● Activity Procedure

Part 1: Introduction and Preparation

- Begin the discussion by reviewing examples of decision-making in everyday lives. Have students give you examples of decisions they make each day (such as what clothes to wear, what to eat, and what television program to watch).
- Now consider larger-scale decisions: Who is responsible? Why are these decisions made, and whose opinions are reflected in these decisions? Encourage students to think about their home and school setting as well as society in general. It may be helpful to make a chart, like the one below, on the board to organize these ideas, or to have students brainstorm on paper as a group.

	HOME	SCHOOL	SOCIETY
Who makes the rules?			
Who governs this area?			
Why do we have rules here?			
What happens if you don't follow the rules here?			
What do you think would happen if there were no rules?			
What is the process for a new rule to be established?			

- Review the basics of democracy. Students should understand that the principles of democracy reflect the needs and wants of the people. Rules and laws exist to maintain order and to hold people accountable for their actions. The overall decisions made in a democracy are ones that should be fair and that consider the best interest of all aspects of the community while progressing into the future.
 - Have students consider what would happen if a large percentage of people believed an action was right and another large percentage believed it was wrong. What happens then?



Part 2: Activity

In this activity, students will be using what they know about government and law-making to work together and devise a solid argument against drilling in the Arctic with several key points to defend their stance.

- Before informing students of their task, provide them with some background information about the debate on the drilling in the Arctic. Some of this information can be found in the “Threats Polar Bears Face” section of the [Polar Bear Educator’s Resource Guide](#).
 - The dramatic increase in temperature in the Arctic due to climate change has caused sea ice to melt, creating larger areas of open water. The shipping and oil industries see this as an opportunity for ships to move through and offshore oil deposits to be developed. Much of the world’s untapped oil and gas reserves lie beneath Arctic waters. Oil and gas are natural resources in extremely high demand as the world’s population and energy-hungry lifestyles continue to grow. These fossil fuels are burned in order to power our houses, buildings, and modes of transportation. The rate at which fossil fuels (like oil and gas) are being burned is one of the leading causes of climate change and its effects on our planet.
 - In addition, increased shipping traffic and oil development would bring a greater risk of wrecks, spills, noise, pollution, and the introduction of non-native species. Oil spills can kill birds, fish, and marine mammals, as well as the smaller organisms that provide food for these larger species. Oil development can generate life-threatening levels of ocean noise pollution for marine mammals.
 - Once a spill occurs, it is extremely difficult to contain because there is no technology currently available that will completely do so within a marine environment. These challenges are even greater in the extreme conditions of the Arctic where storms are frequent, ice is present for much of the year, daylight is nonexistent during the winter, and response infrastructure is more than 1,000 miles away.
- If possible, divide the class into groups of three to five students. Tell them to consider a situation where there is a law being proposed that would allow drilling in the Arctic. As a group, they will be responsible for presenting an argument outlining why they are against this plan. Not only will they be required to defend their argument using researched information and evidence, but they will also have to propose an alternative plan of action.



- Have individual students within each group be responsible for defending one argument against drilling in the Arctic. Encourage students to choose their own argument to research and defend, or provide them with a list and within each group, students can decide. This information can be found on the WWF website. Reasons could include:
 - The impact on wildlife

Populations of whales, polar bears, seabirds, and walrus are already vulnerable to the Arctic's changing climate. To make matters worse, ships would create noise pollution, and oil spills would destroy the animals' habitat.
 - The impact on local people

The people of the Arctic have lived off their land for centuries. Even a small oil spill or gas leak could jeopardize their food supply and traditions.
 - The difficult cleanup

Past oil spills have proved extremely time-consuming and challenging to clean up. This process would be even harder in the Arctic, with harsh weather conditions and months of darkness.
 - The lack of safety

In such a remote and isolated area, the nearest response help is thousands of miles away. If an emergency occurred, the damage would spread quickly with no immediate help.
 - The continuing contribution to climate change

Carbon dioxide released by burning fossil fuels is already disrupting our climate and damaging the health of our oceans. Drilling for oil and gas would only contribute to the preexisting problem.
 - The economic impact on Arctic communities

Offshore oil exploration, drilling, and production can disturb the fish and animals that are essential to the survival and cultural livelihoods of the people within the Arctic community. Arctic fisheries, which provide both food and economic value around the world, are also at risk.
- As a group, they will also have to propose an alternative solution to drilling that best meets the needs of all. Remind them to use what they learned in the previous activity about the purpose of rules and the principles of a fair government. Encourage them to research alternatives to fossil fuel-based energy production, such as renewable resources like solar power, that they could incorporate into their proposal.
- Each group will present their arguments and alternative solutions to the rest of the class, imagining their goal is to convince a group of government officials to pass legislation to ban drilling in the Arctic.



Part 3: Discussion and Assessment

- Hold a large class discussion recapping each group's arguments and proposed solutions.
- Ask students to describe the challenges they think would arise in similar real-life situations. How do people have their opinions heard? What contributes to a convincing argument? What advice would you give to someone trying to propose a new law or change a current law?
- Propose an additional step: Imagine that working together, the class submits one official argument against drilling in the Arctic. Have the students vote on which group best presented their argument and solution.

● Extended Learning Options

- To add a writing exercise, have students compose a persuasive letter to a friend or family member, using what they've learned in this activity to explain why they are against drilling in the Arctic.
- Start a class fundraiser to protect polar bears and other wildlife and their habitats, using WWF's online fundraising tool, Panda Nation. Learn more at pandanation.org.
- If available, use a tablet or smartphone to download the [WWF Together app](#). Encourage students to explore the polar bear segment, which offers them a glimpse into what is at risk in the future for life in the Arctic.





● Additional Background Info

You can use the information found at the links below to enhance your discussion with the class, or you may want to share some links directly with students if you determine they are grade-level appropriate.

- **Interactive web feature:** [Oil Spills in the Beaufort Sea](#)—an interactive that allows users to simulate oil spills in areas in the Arctic to explore potential impacts
- **Video:** [Stop Arctic Drilling Cold—Keep Oil Under the Sea](#)—provides a concise overview of the devastating effects of an oil spill in the Arctic using colorful graphics; although it references the Obama administration, it can be used to compare and discuss the outcome of those previous talks with current talks
- **Article:** [How would offshore oil and gas drilling in the Arctic impact wildlife?](#)—describes how some of the Arctic’s abundant wildlife would be impacted by offshore drilling and a potential oil spill in the Arctic
- **Article:** [Imperiled polar bears face new threat in Alaska’s Arctic National Wildlife Refuge](#)—explains the importance of Alaska’s National Wildlife Refuge to polar bears and why it’s at risk



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Learning Activity:

Polar Bear Freeze

Activity Type	Game
Focus Areas	Physical education, science
Time Required	20–30 minutes

● **Overview**

This polar bear-themed twist on a classic game will allow students to understand the stamina, focus, and patience polar bears need when hunting for food. In addition to learning about the bears’ physical abilities, students will learn about a polar bear’s habitat and how climate change is affecting it.

● **Objective**

At the completion of the activity, students should be able to:

- Describe the challenges of a polar bear’s eating habits.
- Connect the polar bear’s survival needs to sea ice.
- Explain how a decrease in sea ice would affect polar bears and seals, their main prey.

● **Subject and Standards**

Shape America National PE Standards—Highly Effective Physical Education

- Standard 1: The physically literate individual demonstrates competency in a variety of motor skills and movement patterns.
- Standard 2: The physically literate individual applies knowledge of concepts, principles, strategies, and tactics related to movement and performance.
- Standard 4: The physically literate individual exhibits responsible personal and social behavior that respects self and others.
- Standard 5: The physically literate individual recognizes the value of physical activity for health, enjoyment, challenge, self-expression, and/or social interaction.



Next Generation Science Standards

- 3-LS4-3 Biological Evolution: Unity and Diversity
 - Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
- 3-LS4-4 Biological Evolution: Unity and Diversity
 - Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

Materials Needed

- A large open area
- [Polar Bear Educator's Resource Guide](#) (for background reading)

Vocabulary

- **Climate change:** a change in climate over time due to natural causes or as a result of human activity
- **Habitat:** a natural environment in which plants and animals live, breed, and get their food, water, and shelter





● Activity Procedure

Part 1: Introduction and Preparation

- Prior to playing the game, students should have a foundational understanding of a polar bear's habitat, diet, and behavioral traits (you can find this information in the [Polar Bear Educator's Resource Guide](#), under the "Fun Facts" and "Q&A" sections). Share this information with them, or have them read it on their own. Then discuss the following points:
 - Polar bears spend over 50% of their time hunting for food. In the harsh environment of the Arctic, sometimes meals are hard to come by. Polar bears require large amounts of fat to provide energy, especially during those months when food is scarce. Therefore, their primary food source is ringed and bearded seals.
 - Seals, just like polar bears, rely on sea ice to breed and rest. They too need to reach the surface to breathe when not swimming. They typically maintain a network of ice holes that they keep open with the claws on their flippers to provide alternative breathing opportunities when polar bears take up position over one of the holes.
 - Polar bears have a keen sense of smell and can sniff out these seal breathing holes. Upon discovering one, they sit motionless above it for hours, sometimes days, patiently waiting for a seal to surface. At this point, they will attempt to grab the seal and eat it. A large seal can provide enough energy for approximately eight days, but in order to store up reserves, a polar bear needs to eat far greater amounts of food.





Part 2: Activity

- This game is played similarly to the game Statues. Explain the rules of Statues in case students are not familiar with it:
 - One person starts out as “it” and stands at one end of a large playing space; all other participants are “statues” and stand at the opposite end.
 - The person who is “it” turns their back to the playing field and the “statues.” The goal of the “statues” is to race across the field and tag the person who is “it,” thus becoming “it” and resetting the game.
 - Whenever the “it” person turns around, the “statues” must freeze and hold their position for as long as the “it” person is looking at them. As soon as the “it” person’s back is turned again, “statues” are free to move.
 - If a “statue” is caught moving, they are sent back to the starting line to begin again.
- In this version of the game, the student who begins the game as “it” will be the seal, and the “statues” will all be polar bears. The polar bears are trying to catch the seal for their next meal. However, students will have to remain motionless in order for the seal not to detect their presence. The polar bear that does the best job approaching the seal without getting caught moving will reach the seal and gain a meal. The rest of the polar bears will go hungry.
- The seal may turn around at any point. When it does, the polar bears are to freeze and hold their position. If they continue to run, stumble, or move in any way, they will have to return to the starting line because the seal would have detected their presence and relocated. Once the seal has again turned its back, the polar bears can continue to move toward it. The person assigned the role of the seal may turn around as many times as they wish to freeze the polar bears into place. The first polar bear to reach the seal wins the round of the game.

Part 3: Discussion and Assessment

- Recap the game by asking students to discuss the challenges. Which was more difficult—remaining motionless or being ready to move as soon as you saw a seal turn back around? A polar bear’s life sometimes depends on this cat-and-mouse interaction, so its reaction speed and concentration are crucial. Be sure to inform students that unlike in the game, polar bears do not hunt seals in packs, and often have to walk or swim long distances to find food.



- Remind students of the game’s real-life relevance by discussing the importance of sea ice. Sea ice provides habitat for polar bears to breed, rest, and feed. Seals also rely on sea ice for protection and habitat to raise their young. Without sea ice, the survival of both species is at risk. The increase in global temperatures due to climate change continues to cause sea ice to melt at an alarming rate. As seals lose their sea ice habitat, they will relocate, looking for other areas to raise their young and rest. Polar bears also lose their habitat, as well as their food source, and are forced to venture to other areas as well. Their keen sense of smell sometimes leads them toward communities where they detect food that has been left outdoors. These encounters often end in tragedy, as both the people and the polar bears feel their safety threatened.
- There are ways we can slow the effects of climate change and protect this sea ice habitat that polar bears and seals so heavily rely on. As part of the discussion, encourage students to suggest ways they can help, or share the information found in the [Polar Bear Educator’s Resource Guide](#) under the “What Kids Can Do” section.

● Extended Learning Options

- If available, use a tablet or smartphone to download the [WWF Together app](#). Encourage students to explore the polar bear segment, which contains interactive modules that put your sea ice balance and patience skills to the test.
- Start a class fundraiser to protect polar bears and other wildlife and their habitats, using WWF’s online fundraising tool, Panda Nation. Learn more at [pandanation.org](#).
- Pair this activity with another from the [Polar Bear Toolkit](#), such as *Climate Trackers* or *What’s the Connection?* to learn more about the importance of sea ice and why it’s melting.





● Additional Background Info

You can use the information found at the links below to enhance your discussion with the class, or you may want to share some links directly with students if you determine they are grade-level appropriate.

- **Video:** [Melting Sea Ice Forces Bears to Swim Longer](#)—outlines the risks polar bears face when they're forced to swim longer distances due to melting sea ice
- **Article:** [Collaborating to Count Arctic Seals and Polar Bears](#)—describes how scientists from the United States and Russia are joining forces using a new technology to count numbers of polar bears and seals from above
- **Article:** [Lack of winter sea ice disrupts life in the Arctic](#)—impacts of one of the lowest-recorded yearly levels of sea ice in the Arctic
- **Article:** [Climate change puts the Pacific walrus population on thin ice](#)—how the receding sea ice in the Arctic is impacting walruses
- **Article:** [Why are glaciers and sea ice melting?](#)—outlines the effects melting glaciers and sea ice have on species and communities around the world



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