A Polar Bear Platform

4th Grade Unit

Created by Emily Miller, Student of Alaska Pacific University, Master of Science in Outdoor and Environmental Education Candidate
"Polar Bear Adaptations" coloring sheet created by Peppermint Narwhal

Transfer Goals:

Students will be able to independently use their learning to:

- Create a connection to a global dialog to engage within their community
- Analyze models to understand ecosystem(s) and communicate aspects of ecological phenomena

Essential Questions:

Why is sea ice so important to polar bear survival?

Standards:

4-LS1-1
4-LS1-2

Materials:

- "Polar Bear Adaptations" coloring sheet
- Coloring utensils
- "Color by Ecoregion" worksheet
- Youtube videos

Objectives:

Students will know:

- Why sea ice is important for local (Arctic) and global ecosystems

Students will be skilled at:

- Forming a correlation between polar bear conservation and the protection of all

Students will understand that:

- The Arctic drives global systems.

Description:

This lesson introduces argumentative statements to help connect polar bear adaptations and survival in the Arctic. The lesson will also introduce Arctic sea ice ecoregions and how polar bears live differently throughout the Arctic.

Vocabulary:

Ecoregion: An area of sea ice that is defined by its formation type

Duration: 1.5- 2 hours

Lesson Plan

Engage:

- Hand out the “Polar Bear Adaptations” coloring sheet
- Begin the class with these questions and allow students some time to speak with a neighbor about their answer.
    - Is all sea ice the same?
    - Do polar bears need sea ice to survive?
- Introduce sea ice ecoregions through this video: https://www.youtube.com/watch?v=iaT2SssKc2Q
- Check in with students’ social and emotional feelings before moving on to the Color by Ecoregions worksheet. Ask these questions.
    - How are you feeling about what we are learning about sea ice?
        - Remind students that it is normal to feel worried about this but then lead them to remember as a group, we can make a big change and help polar bears.
        - Being kind to nature and taking responsibility for our outdoor spaces can help remind us that we are not alone.
- Take students outside to connect them back to nature. Ask them to find three things that they see that make them happy. Then ask them to think of one thing they can do today to be kinder to our Earth, have them promise themselves they will take that action.

Explore:

- Let students complete the “Color by Ecoregion” worksheet.

Explain:

- Prepare students to watch an archived Tundra Connections about one ecoregion and the polar bears that live there.
- Prompt students to take notes during the video so they can better complete the task after. https://www.youtube.com/watch?v=29vmND3crXk&list=PLtVrwxiZ_3tSWeGq4AAfOVAEvaXh2MjIy&index=14

Elaborate:

- Give students the opportunity to work through the prompt below. This can be done individually or in groups. If argumentative statements are new to your class, complete this activity in groups.
    - Construct an argument about polar bears having internal and external structures that function to support survival, growth, behavior, and reproduction. Describe how polar bears in Churchill, Manitoba, may be different from polar bears in another ecoregion.
- Guide their answers with these questions:
    - The Claim
        - What do I think?
    - The Reasons
        - Why do I think this?
    - The Evidence

    - How do I know this is the case?

Evaluate:

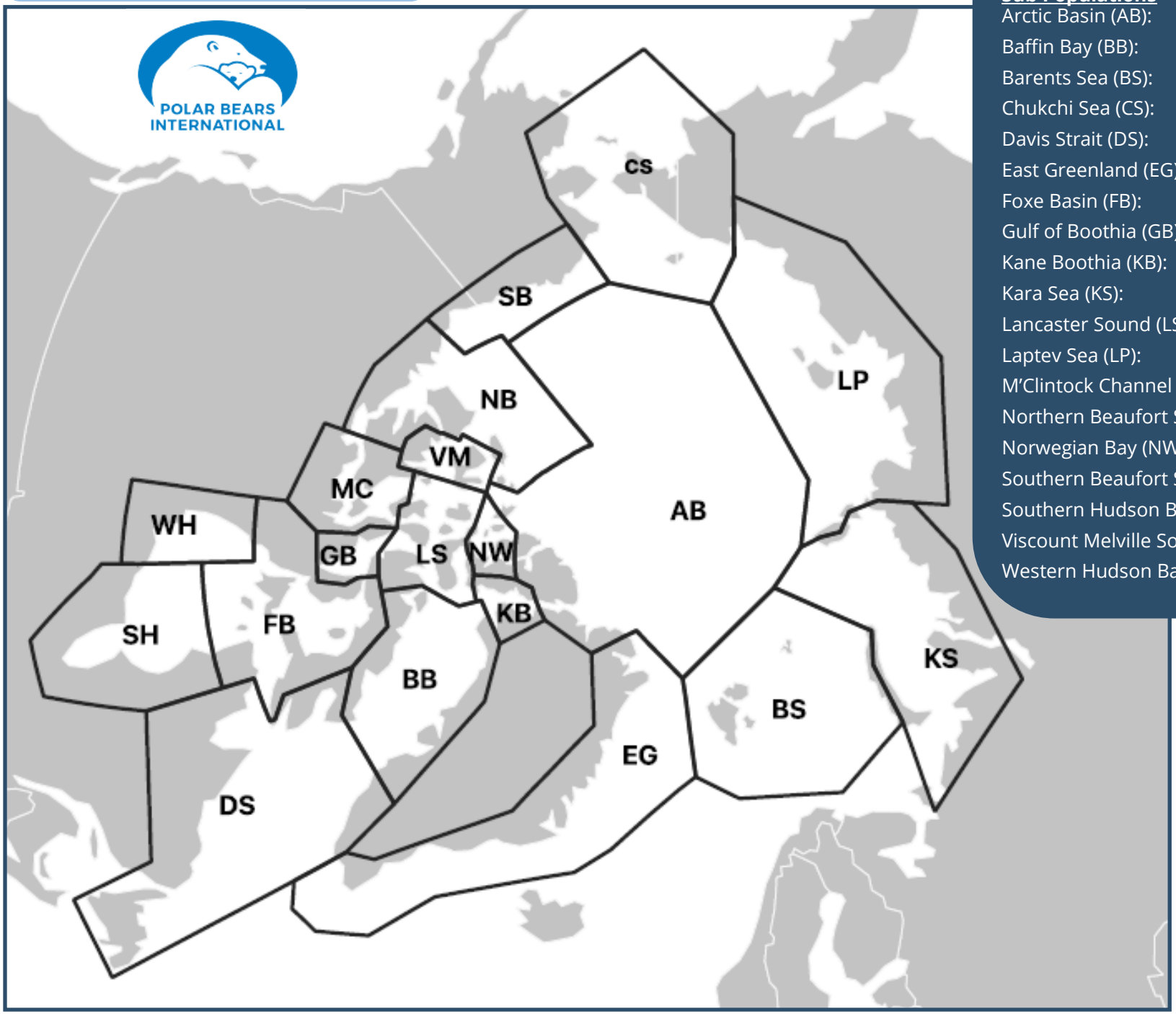
- Give students the opportunity to share their arguments.

References

- "Polar Bear Adaptations" coloring sheet created by Peppermint Narwhal
- Sea Ice Ecoregions https://www.youtube.com/watch?v=iaT2SssKc2Q
- Tundra Connections: The Phenomena of Polar Bear Migration https://www.youtube.com/watch?v=29vmND3crXk&list=PLtVrwxiZ_3tSWeGq4AAfOVAEvaXh2MjIy&index=14
- Four Ecoregions https://polarbearsinternational.org/news/article-polar-bears/four-sea-ice-ecoregions/
- Polar Bear Tracking https://polarbearsinternational.org/polar-bears/tracking/

Color By Ecoregions

Directions: Shade in each polar bear subpopulation on the map according to the ecoregion that they live in. Use your color key and ecoregion key to help you.



Ecoregion Key:

Sub Populations	Ecoregions
Arctic Basin (AB):	Convergent Ice
Baffin Bay (BB):	Seasonal Ice
Barents Sea (BS):	Divergent Ice
Chukchi Sea (CS):	Divergent Ice
Davis Strait (DS):	Seasonal Ice
East Greenland (EG):	Convergent Ice
Foxe Basin (FB):	Seasonal Ice
Gulf of Boothia (GB):	Archipelago
Kane Boothia (KB):	Archipelago
Kara Sea (KS):	Divergent Ice
Lancaster Sound (LS):	Archipelago
Laptev Sea (LP):	Divergent Ice
M'Clintock Channel (MC):	Archipelago
Northern Beaufort Sea (NB):	Convergent Ice
Norwegian Bay (NW):	Archipelago
Southern Beaufort Sea (SB):	Divergent Ice
Southern Hudson Bay (SH):	Seasonal Ice
Viscount Melville Sound (VM):	Archipelago
Western Hudson Bay (WH):	Seasonal Ice

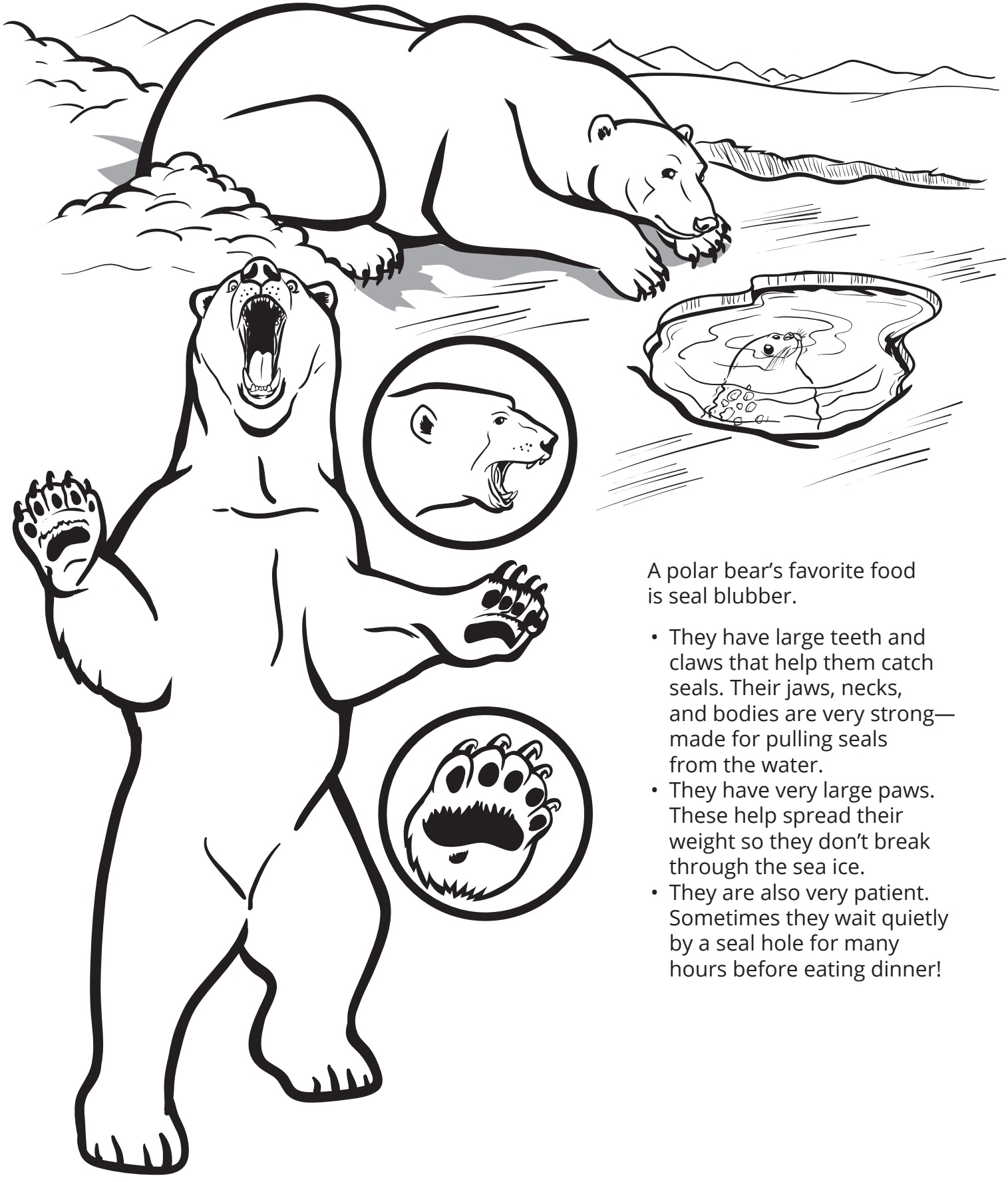
Color Key:

Convergent Ice:	Green
Divergent Ice:	Blue
Seasonal Ice:	Red
Archipelago:	Yellow

Created by Emily Miller

Polar Bear Adaptations

Built for Hunting Seals



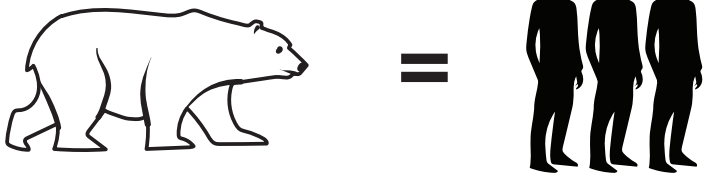
A polar bear's favorite food is seal blubber.

- They have large teeth and claws that help them catch seals. Their jaws, necks, and bodies are very strong—made for pulling seals from the water.
- They have very large paws. These help spread their weight so they don't break through the sea ice.
- They are also very patient. Sometimes they wait quietly by a seal hole for many hours before eating dinner!

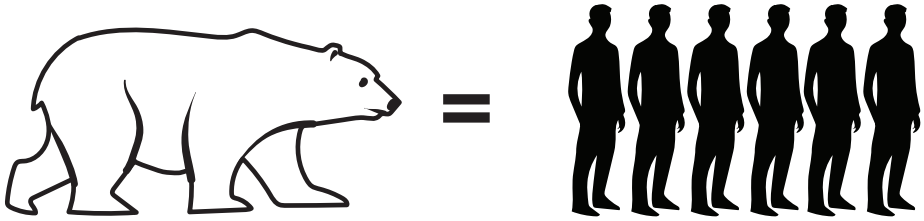
Polar Bear Adaptations

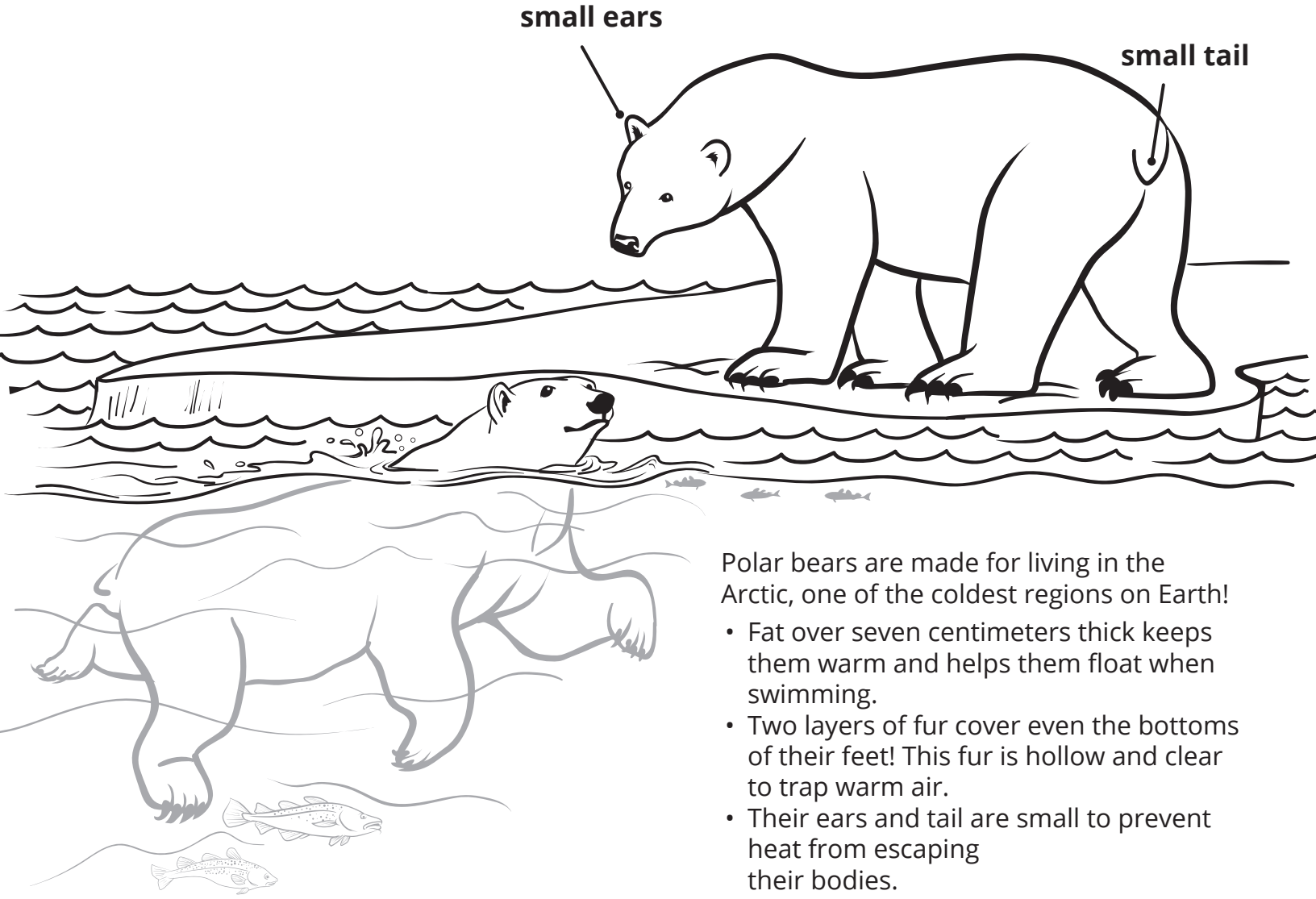
Built for Cold

average female weighs 200 kg



average male weighs 400 kg





Polar bears are made for living in the Arctic, one of the coldest regions on Earth!

- Fat over seven centimeters thick keeps them warm and helps them float when swimming.
- Two layers of fur cover even the bottoms of their feet! This fur is hollow and clear to trap warm air.
- Their ears and tail are small to prevent heat from escaping their bodies.

Sensational Sea Ice

4th Grade Unit

Created by Emily Miller, Student of Alaska Pacific University, Master of Science in Outdoor and Environmental Education Candidate
"Polar Bear Adaptation Matching game" worksheet created by Peppermint Narwhal

Transfer Goals:	Essential Questions:
Students will be able to independently use their learning to: • Develop models to evaluate ecosystem(s) and communicate ecological phenomena • Understand global issues to communicate, evaluate, observe, and explain responses • Enjoy creative expression and emotion with the natural world	Why is sea ice an important part of the Arctic?

Standards:	Materials:	Objectives:
4-LS1-2	• Map of Arctic Sea Ice • Paper • Pencil • "Polar Bear Adaptation Matching Game" Activity 1: • Ice • Salt • Green food dye • Water • Dropper Activity 2: • A large space Activity 3: • Ice • Heat lamp, or outdoor space	*Students will know:* • Communities live and rely on the Arctic • Why sea ice is important for local (Arctic) and global ecosystems *Students will be skilled at:* • Creating inferences between local and global systems • Forming a correlation between polar bear conservation and the protection of all *Students will understand that:* • The Arctic is home to many. • The Arctic drives global systems.

	• Black or dark blue paper • White paper • Scissors	

Description:

This lesson is intended to explore the importance of sea ice to animals, plants, people, and global systems. At the end of this lesson, students will have participated in experiments, games, activities, and creative expressions to further understand sea ice and its significance to them.

Vocabulary:

Arctic: A cold region around the North Pole
Sea Ice: Frozen salt water in the ocean

Duration: 1.5- 2 hours or 3- 30 minute lessons

Lesson Plan

Engage:

- Begin by showing students a map or the globe that represents Arctic sea ice and begin a discussion to define sea ice.
    - Where can you find sea ice?
    - How is sea ice different from the ice in your freezer?
    - How does sea ice affect animals and people in the Arctic?
    - How does sea ice affect you?
- Explain that sea ice has many important properties and those properties affect all of us.

Explore/ Explain:

Use these three activities to explore the importance of sea ice. These activities can be done as demonstrations, stations, or class participation. They can be done over the course of a few sessions or all in one lesson. Each activity should take 10-20 minutes.

1. **Sea ice is like soil?**
    - Give students a piece of fresh ice and ask them to study the texture of the ice.
    - Direct students to take a pinch of salt and sprinkle it on the ice cube and watch as the ice cube changes. Make sure students are taking note of the texture of the cube.
    - Once the ice has become rough with channels (5-10 minutes) use a dropper and to drop one drop of green colored water onto the ice cube. Observe the small channels that have formed in the ice.
    - Explain:
        - When ocean water gets cold enough to freeze it expels its salt, causing channels to form in the ice. Algae grow within these channels and form the base of the food chain. Algae feed the tiny organisms, like zooplankton, that

inhabit these waters. Arctic cod feed on zooplankton. Seals eat Arctic cod. And polar bears prey on seals.
    - Review the Food Chain Graphic
2. **Polar bears rely on sea ice.**
    - For this station, students will be playing a game to exemplify polar bear hunting skills. The game will be played like "Sharks and Minnows" but we will call it "Polar Bear and Seals".
        - In a large open space, assign one student as the polar bear and the rest of the students will be seals. The polar bear will be in the center and the seals will line up on one end of the playing area.
        - The object of the game is for the polar bear to tag or "hunt" as many seals as it can. The seals will try to run across the playing area to the other end without getting tagged. Most students are familiar with the game, so once you explain that the polar bear does not have any ice to hunt its prey, it must try and swim to catch seals. Tell the student who has been selected to be the polar bear that they will be on their hands and knees while the "seals" are aloud to run normally
            - Explain that seals are much faster swimmers than polar bears so this will make hunting difficult.
        - Allow students to play this way for a few turns.
        - Now tell students that the sea ice has returned. The polar bear may use the sea ice to hunt (aka the student who is the polar bear can run on their feet).
        - Allow students to play this way for a while.
        - Ask the polar bear which way took less energy and caught more seals?
    - Explain that although seals can out-swim polar bears underwater, bears have the advantage on top of the ice, using it to sneak up on and stalk their next meal. Ice seals, and related ice-dependent species like the walrus, rely on sea ice for survival, too—they use it to rest on and as a platform for giving birth to and raising their pups. **Arctic sea ice is important to people living in the North, providing a platform for transportation and increased access to food.**
3. **Air conditioner for our Earth**
    - Go outside on a sunny day or use a heat lamp for this experiment.
    - Cut out two squares of construction paper. One should be black or dark blue and the other should be white. Make sure the paper is of a similar thickness.
    - Under the heat lamp or direct sun, place two ice cubes down and then cover the ice cubes by placing the dark colored paper on top of one cube and the white colored paper on top of the other cube.
    - Allow a few minutes for the students to watch the ice melt. At that time, observe the paper and ask students which cube of ice melted faster.
    - Explain that the dark piece of paper represents the ocean without sea ice and the white piece of paper represents the ocean with sea ice. Sea ice acts like a global air conditioner, helping to cool the planet by reflecting the sun's light and heat back into space rather than absorbing it into the water. This helps keep all of us cool!

Elaborate:

- Give students a few minutes to create an Acrostic poem about why sea ice is important that spells SEA ICE.

Example:

Seals need rest
Enormous home for polar bears
Algae's home

Important platform for people
Cools down the earth
Even acts like soil

Evaluate:

- Finish the lesson with the "Polar Bear Adaptation Matching Game"

Extension:

- Tundra Connections: Arctic Sea Ice Day 2021 https://www.youtube.com/watch?v=eic_zA8sQcg&list=PLtVrwxiZ_3tSWeGq4AAfOVAEvaXh2Mjly&index=1

References

- "Polar Bear Adaptation Matching Game" worksheet created by Peppermint Narwhal
- A Life Tied to Sea Ice https://www.youtube.com/watch?v=HYXvtQzmiDU
- Tundra Connections https://www.youtube.com/watch?v=eic_zA8sQcg&list=PLtVrwxiZ_3tSWeGq4AAfOVAEvaXh2Mjly&index=1

Polar Bear Adaptation Matching

MATCH EACH BEAR FACT BELOW TO THE GRAPHIC ON THE RIGHT THAT BEST ILLUSTRATES THAT FACT.

FACTS

1. Polar bears have developed amazing adaptations for dealing with frigid Arctic weather and a life on the sea ice.

2. Two layers of fur and a thick padding of fat help keep polar bears warm, and the polar bear's compact ears and small tail prevent heat loss.

3. Small pads on the bottom of the polar bear's paws, called papillae, grip the ice and prevent them from slipping.

4. Polar bears rely on sea ice for reaching their seal prey. Hungry bears catch seals at their breathing holes or along ice edges when they come up for air. Without sea ice, polar bears will struggle to survive in many parts of the Arctic. And Arctic sea ice is at risk ...

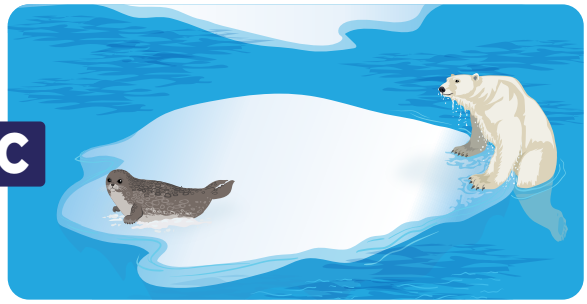
5. Gases in the atmosphere act like a blanket trapping heat around Earth. When we burn fossil fuels like coal, oil, and gas, we pump extra CO2 into the atmosphere, thickening the blanket and disrupting our global climate. Just as a hot summer day melts ice in a glass of water, a warming planet melts Arctic sea ice.

6. Sea ice losses from climate change are the biggest threat to polar bears—and the reason the bears are listed as Vulnerable on the Red List of Endangered Species. But we can change that by reducing our use of fossil fuels, helping polar bears and people, too!

A

B

C



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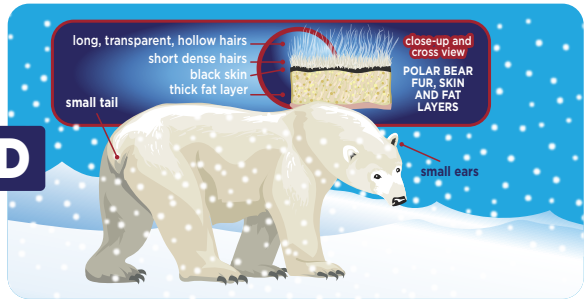

E

F

My Wounded Island

4th Grade Unit

Created by Emily Miller, Student of Alaska Pacific University, Master of Science in Outdoor and Environmental Education Candidate

Transfer Goals:	Essential Questions:
Students will be able to independently use their learning to: • Apply environmentally minded actions through behavior changes • Create a connection to a global dialog to engage within their community • Understand global issues to communicate, evaluate, observe, and explain responses • Appreciate 'place' by connecting with global and local culture • Enjoy creative expression and emotion with the natural world	Who lives in the Arctic?

Standards:	Materials:	Objectives:
CCSS.ELA-LITERACY.RF.4.4	• Paper • Pencil • Materials for Action Items *See links below	*Students will know:* • Communities live and rely on the Arctic. *Students will be skilled at:* • Implementing protection of a place through culture and community • Forming a correlation between polar bear conservation and the protection of all *Students will understand that:* • The Arctic is home to many.

Description:	Vocabulary:

This lesson serves as an introduction to communities that live in the Arctic, and how they are being affected by climate change. This lesson also creates a connection to those communities and global issues through social and emotional check-ins, vocabulary exploration, and journal activities. In order to create understanding, space and time must be held for social and emotional reactions, expression, and action. This story centers around a young girl's connection to her home and the fear and anxiety she has as she tells the story of why she will have to leave it due to sea-level rise. It is necessary that we provide space before and after reading the book for your class to emotionally process the story to move through the fear and into the intended purpose of the unit which is to connect students in ways that sea ice and Arctic habitat are an important supporting habitat for everyone and is worth creating action.

Alaska: A state in the USA in the extreme northwest of North America
Iñupiat: The language spoken by the Iñuqiaq nation, or the Native Alaskans from northern regions of Alaska.
Bewitch: Put a spell on someone's
Spirit-animal totem: A sacred animal that accompanies someone through his or her life, acting as a guide
Nome: A city of five thousand inhabitants, situated on the mainland, two hundred kilometers south of Shishmaref
Pack Ice: Thick layer of ice that forms on the sea in polar regions
Russia: The largest country by area in the world, stretching from Europe to Asia
Sedna: Goddess of the sea, part of the Inupiat creation story and beliefs
Tundra: Great treeless plains, covered in mosses and lichens, where the ground remains frozen all year (frozen soil is called permafrost)

Definitions from "My Wounded Island" by Jaques Paswuet and Marion Arbona

Duration: 1.5-2 hours (3 hours with extensions)

Lesson Plan

Engage:

- Watch this video about Arctic Communities Ice Fishing
  - https://www.youtube.com/watch?v=TzG_RYQGs1w
- Begin this lesson by reading "My Wounded Island" by Jaques Paswuet and Marion Arbona
  - This book can also be found on youtube https://www.youtube.com/watch?v=ci3eUVI7IYE

Explore:

To check in to the social and emotional dynamic of your class, complete the following. Create a safe space for students to feel comfortable. Lights could be turned down, students could join you on the floor and get comfortable. You could even set low, calming music. Allow enough time for a conversation to happen organically. Sharing your own feelings first could help students feel more comfortable in sharing. Do not force students to share. A great tool to support this activity is an emotions chart that everyone can read on their own.

- Once a safe comfortable space is created, ask students to tune into their bodies, and take a

few deep breaths.

- Ask themselves, "How am I feeling about climate change right now, at this moment?" Allow students to answer those questions for themselves, inwardly.
- After a few minutes, let students have 2-5 minutes to quietly find an object around the room to help them describe how they are feeling.
- Gather students, and go around a circle and share how you are feeling. If other students are feeling similar to another student, they may show that by putting their hands over their hearts. Create space for productive and supportive conversation.
- Once everyone has finished sharing, remind students that it is normal to feel worried about climate change. Create a connection to the idea that as a group, we can accomplish more than what we could as an individual. Community-based solutions are important and one of those solutions is learning and talking about it to spread awareness.

Explain/ Elaborate:

- Use the story "My Wounded Island" to guide a vocabulary exploration.
- Separate students into groups. Give each group 4 sticky notes. Have each team be assigned a few pages of "My Wounded Island" and mark 4 words that they think are most important. Encourage students to take their time and move around their sticky notes if they need to. Once they have chosen their words, have students write them down on sticky notes and place them on the board.
- Once all of the sticky notes are displayed at the front of the class, analyze the text as a group to help infer what the words mean.
    - Use the glossary to help guide or fill in.

Evaluate: ☆

- To evaluate the students' learning, give time for students to complete a journal activity using the vocabulary explored. Use this writing prompt:

    Using as many vocabulary words as you can, compare and contrast your home and Imarvaluk's Arctic home. After your response, draw a picture illustrating the comparison of your home and Imarvaluk's home.
- Check-in with feelings one more time:
    - Ask this question: "If you could tell Imarvaluk something to make her feel better, what would you tell her?" Give students a moment to write down their answers and then share.

☆ One way we can combat a sense of fear and paralysis around climate change is to do something (big or small) to take care of our planet. We strongly recommend inviting the students to immediately do something positive together. Here are some suggestions….

- Short class solution activities:
    - Unplug
        - This can be as simple as leaving the lights off for the rest of the day and using natural light if it's available.
        - If window lighting is sufficient, have students buddy up and ask other classrooms to turn off their lights for a short period of time. *Communicate to other teachers prior to increase positive responses when students go around and make their ask.
        - If available, use outdoor space to have class.
    - Indoor Plants

https://www.youtube.com/watch?v=PRYOHBPyxtU
https://www.youtube.com/watch?v=VYAkOFhZdC4

- This could be a good opportunity to plant some classroom plants and create roles for taking care of the plants. This will connect students to similar roles of taking care of the Earth, growing their own food, etc.
    - Chia seeds are an affordable option (chia is an edible microgreen).

- Seed Paper/ Seed Bombs
  https://www.youtube.com/watch?v=N3tbZguBzG8
    - Use scrap paper around your room and a native seed mixture to create seed bombs. This is a really great option if planting outside is out of season.
- Clean up
    - Choose a local outdoor space to clean up

References

- Indie Alaska, I Am An Ice FIsherman
  https://www.youtube.com/watch?v=TzG_RYQGs1w
- "My Wounded Island" by Jaques Paswuet and Marion Arbona
  https://www.youtube.com/watch?v=ci3eUVI7IYE
- Planting Chia Seeds
  https://www.youtube.com/watch?v=PRYOHBPyxtU
  https://www.youtube.com/watch?v=VYAkOFhZdC4
- DIY Seed Bombs
  https://www.youtube.com/watch?v=N3tbZguBzG8

Umbrella Species

4th Grade Unit

Created by Emily Miller, Student of Alaska Pacific University, Master of Science in Outdoor and Environmental Education Candidate

Transfer Goals:	Essential Questions:
Students will be able to independently use their learning to: • Analyze models to understand ecosystem(s) and communicate aspects of ecological phenomena • Enjoy creative expression and emotion with the natural world	Who lives and makes up the Arctic?

Duration:	Materials:	Objectives:
1.5-2 hours	• Art materials	*Students will know:* • The key term umbrella species *Students will be skilled at:* • Creating inferences between local and global systems • Forming a correlation between polar bear conservation and the protection of all by creating communication pieces *Students will understand that:* • The Arctic is home to many. • Polar bears are an umbrella species.

Description:	Vocabulary:
This lesson introduces the term umbrella species to create a connection between polar bear conservation and the protection of all by creating a communication piece. The lesson will explore ecosystem interdependence while creating inferences between local and global systems. Students will use art and creativity to express polar bear conservation ideas.	**Umbrella Species:** A species selected for conservation. The conservation of that one species typically helps the conservation of many other organisms in its ecosystem. **Conservation:** The protection of an organism through maintaining and restoring habitat, enhancing ecosystem services, and protecting biodiversity

Lesson Plan

Engage:

- Ask students to take a guess at what an “umbrella species” might be. Instruct them to turn to their neighbor and try and convince them that their definition is correct.
- Show this video on A Life Tied to Sea Ice https://www.youtube.com/watch?v=HYXvtQzmiDU

Explore:

Webbing

- Find a large space where students can form a circle. The leader will stand inside the circle near the edge of, with a ball of string.
- Ask for a volunteer to be Algae and then hand the ball of string to that student while the leader continues to hold onto their end.
- Begin letting the students guide the next animal or plant that could be connected to Algae and continue passing the string, i.e Algae-Plankton-Diatoms-Cod-Seals-Polar Bears.
- Encourage students to include humans in this web!
- Once the web is complete and now represents the Arctic ecosystem, demonstrate how polar bears are extremely interconnected to many other species of the Arctic by having the person who is the polar bear, drop their string. Continue to have students go down the web and talk about what other species might be affected.
    - Make sure all parts of the web are pulled tight for a more drastic effect.
    - If extra time allows, take away different animals, make new webs, and let students explore.

Explain:

- Give students a few minutes to come up with new or improved definitions of an umbrella species. Then, as a class, let some discussion happen and make up a singular class definition of an umbrella species.

Elaborate:

- Write “polar bear” on the board far up at the top. Explain that by protecting polar bears we are protecting many different things, living and nonliving. Ask each student to come up and write one thing that would be protected, as a result of protecting polar bears. This might start slow, but once students get going it should catch on fast.
- Now, create a list of action items your class can take to help polar bears and therefore everything under polar bears.
    - Examples: Take the bus or walk to school, talk about polar bears and the Arctic to your friends and parents, ask your class if they can do a hand-me-down drive, unplug items not being used, compost, turn lights off that aren't being used, plant gardens, turn down thermostat

Evaluate:

- Tell students that they are going to help polar bears today by “talking about it” using art
- Give students some time to get creative and make a piece of artwork communicating the concept of polar bears being an umbrella species for the Arctic. The previous pieces of the lesson should prompt them with ideas. Encourage them to think out of the box, but remind them that the artwork should speak for itself.

Extension:

- The piece of art can be followed up by a writing activity describing their art and an art display is recommended to facilitate the climate change solution of communication.

References

- A Life Tied to Sea Ice https://www.youtube.com/watch?v=HYXvtQzmiDU
- What Does an Umbrella Have to Do With Sage-Grouse? Lesson by Idaho Rangeland Resource Commission https://idrange.org/wp-content/uploads/2017/06/Lesson_Plan_Sage_Grouse_Umbrella.pdf
- Sharing Nature with Children by Joseph Cornell, Webbing Lesson

Paws Up for Polar Bears- A Kids Climate Change Curriculum (pilot)

Evaluation Forms

Please use the links below, and complete each evaluation, corresponding with the unit/lesson(s) used.You will only need to evaluate the individual lessons you've used. If you used a combination of unit/lesson(s), please complete all corresponding unit evaluations.

Evaluation Form Links:

- 3rd Grade Unit: https://forms.gle/ahiKmASSmRcuojDX9
- 4th Grade Unit: https://forms.gle/HF3m1g5jHbQ3HAhXA
- 5th Grade Unit: https://forms.gle/MYtRfV6r5yrUrCfr9

Please direct any questions or technical issues to ekmiller100@alaskapacific.edu.