



Polar Bear Tracker

Grade Level: Middle/High School

Time: This lesson will take two to three class periods to complete all activities. Note: Extra time may be required to review background information on polar bears.

Materials

- Internet access (websites provided in the lesson)
- Explore the Bear Tracker Worksheet (one per pair of students)
- Teacher Copy—Guided Discussion & Answer Key
- Writing implement

Key Words

>8/10ths coverage (sea ice layer): This refers to the sea ice concentration.

Marginal Ice Zone: Ice that forms the boundary between the open ocean and ice-covered seas. It is the most productive and where the Arctic food web primarily exists.

Polar bear subpopulations: The 19 subpopulations of polar bears are determined based upon geographic location.

Satellite collars: Collars that track bears' locations using transmitters to communicate with Global Positioning Satellites (GPS).

Radio Telemetry Tracking: The process of transmitting information from satellite collars.

Sea Ice: Frozen seawater that covers about 12% of the world's oceans.

Lesson Overview

Explore the world of polar bear researchers through the PBI [Bear Tracker webpage](#) and the [Bear Tracker PowerPoint](#). Understand how polar bears are studied using radio collar tracking and track bears in real time. Through the inquiry process, create scientific investigable questions just like real researchers, and learn how you can take action to help polar bears.

Objective

Students will be able to:

1. Discuss why and how researchers study polar bears.
2. Use the [PBI Bear Tracker page](#) to observe and analyze data gathered by tracking polar bears.
3. Create investigable questions and use these questions to better understand how scientists solve real-world problems.
4. Describe the movements of polar bears on Hudson Bay based upon season and ice coverage

Background Information

Polar bears cover hundreds of miles in pursuit of both seals for food and for mates.

To track how bears travel, PBI works with polar bear researchers to place satellite collars on polar bears in different parts of the Arctic, including the Hudson Bay.

Collars are placed on adult female polar bears for about 12-14 months. Collaring male bears is ineffective, as collars slip off male bears' heads.

The polar bears' positions are transmitted with Global Positioning Satellites (GPS) from the collars on the bears' necks to scientists, then to the PBI Bear Tracker site.

The process of transmitting data is called **radio telemetry tracking**. Telemetry is one of the few means through which scientists can follow polar bears for long periods of time to monitor their movements, habitat use and the survival of cubs. This information helps scientists learn how polar bears are affected by climate change.

Teacher Prep Notes

This lesson contains multiple activities. Students and teachers will benefit from prior knowledge of polar bear biology and the effects of climate change on polar bear habitat. Visit the PBI [All About Polar Bears](#) page for background information.

- Download and review the [Bear Tracker PowerPoint](#).
- Download and print copies of Explore the PBI Bear Tracker Worksheet
- Review the worksheet and the PBI Bear Tracker site before introducing your class to it. Use the **Teacher Copy—Guided Discussion & Answer Key** to guide your discussion with your class.

All About Tracking Polar Bears

To Do

Questions to Investigate

- Create a posted list of student Questions to Investigate about bear tracking and sea ice. Keep track of which questions are answered through the lesson and keep track of new questions as they arise.

Students learn the why and how of tracking polar bears

- View the [Bear Tracker PowerPoint](#) as a class to understand why and how scientists study polar bears.
- Read polar bear scientist Alysa McCall's blog [Following Bears on the Sea Ice](#) to understand more about how scientists study polar bears.

Explore the PBI Bear Tracker page

- Divide students into pairs to explore the PBI Bear Tracker page and complete the Explore the PBI Bear Tracker worksheet. Use the Teacher Copy of the worksheet to guide the discussion and review the correct answers as a class. Note: This can be a teacher led activity or small group work.
- Using the [Bear Tracker page](#), what questions do you have about polar bears? What could you investigate with this information?

Assessment

- Review answers on the worksheet.
- Review the Questions to Investigate list. What questions have been answered? What new questions do you have? Challenge the students to explain why a question is scientific and able to be investigated vs. not scientific. What questions can be rewritten into scientific questions?
- In pairs or teams, have students research one of the questions. Create a classroom State of the Polar Bear Conference and have each group present their findings via poster and oral presentation.
- Tech option: Have students create their presentations using computer tools such as Prezi or PowerPoint. Visit PBI's website for informative [student report materials](#).

Taking It Further

How are polar bears affected by climate change?

Polar bears have evolved for a life on the sea ice on which they rely for reaching their seal prey. Arctic sea ice, however, is rapidly diminishing due to a warming Earth, affecting the entire arctic ecosystem, from copepods to seals to walruses.

For polar bears, sea ice loss means reduced access to food, drop in body condition, lower cub survival rates, increase in drowning, increase in cannibalism, loss of access to denning areas, and a decline in population size. Scientists track polar bears to understand the impact of climate change is having on the different polar bear populations. To explore current population, habitat, and threat information for the world's polar bears, use the [State of the Polar Bear Interactive Map](#). And to understand more about current threats to polar bears, watch the following videos:

- [Inherent Threats to Polar Bears](#)
- [Dr. Steven Amstrup—Polar Bears in 50 Years](#)

Take Action!

The good news is that it is not too late to save polar bears! Climate change is driven by the greenhouse gas effect and, most significantly, carbon dioxide (CO₂) emissions. To help save the polar bear's sea ice habitat—lower your carbon footprint! Learn more about Taking Action here, join PBI's [Save Our Sea Ice](#) campaign and share your actions on our [My Planet, My Part](#) page.



© Dick & Val Beck

Explore the PBI Bear Tracker Intro Guide

Teacher Copy—Guided Discussion and Answer Key

Welcome to the Polar Bears International© Bear Tracker page!

Please follow along to familiarize yourself with the site.

Materials

- Internet
- Intro guide
- Writing implement
- PBI [Bear Tracker](#) page
- Blog post [Following Bears on the Sea Ice](#) by polar bear scientist Alysa McCall
- Handout—Explore the Bear Tracker Worksheet

The screenshot displays the PBI Bear Tracker website. On the left, there is a 'Take Action!' section with a paragraph about sea ice levels and a 'Take Action' button. Below that is an 'Educational Materials' section with links to lesson plans, powerpoints, and unit plans. The main area is a map of Hudson Bay and the Beaufort Sea, showing polar bear tracks and sea ice levels. The map includes a 'View Options' panel with 'Map', 'Satellite', 'Path Layer', and 'Ice Layer' options. A '5' in a circle highlights a bear track icon on the map. The top navigation bar includes the 'beartracker' logo, 'POLAR BEARS INTERNATIONAL' logo, 'Fairmont' sponsorship logo, and 'Donate' and 'Adopt' buttons. A date indicator shows '18 Apr 2013'.

What is the PBI Bear Tracker?

Our Bear Tracker shows current and past sea ice levels on Hudson Bay along with rough locations of collared polar bears. Using this tool, you can see how the bears follow the ice throughout the seasons. They rely on the sea ice for hunting seals, finding mates, and sometimes denning. Polar bears cannot survive without sea ice.

Explore the PBI Bear Tracker Intro Guide—Teacher Copy (cont.)

To Do:

Step 1

Have students read Alysa McCall's blog [Following Bears on the Sea Ice](#) to gain an introduction to how scientists research polar bears through collaring and tracking.

Step 2

Questions to Answer:

Have students explore the features of the [PBI Bear Tracker site](#) using these guided questions. *** Please note that specific parts of the Bear Tracker map on the previous page have been numbered for easy reference. ***

1. Q: What is the name of the geographic region where polar bears are being tracked?
A: *Hudson Bay*
2. Q: Where is the Hudson Bay population located on the globe? Name the country and bordering provinces. Click on Map (reference #1) to see names of the country/states/provinces, or choose Satellite for a different perspective.
A: *Hudson Bay is located in northern Canada, with bordering provinces of Manitoba, Ontario, Quebec, and Nunavut.*
3. Q: What time frame does the bear tracker cover? Explore the Play button or the navigable cursor on the top bar (reference #4)
A: *From September 2011 to present*
4. Q: What details are provided for each polar bear? Click on one of the bears (reference #5) for details.
A: *ID Number, Date Collared, Cubs, Weight, Distance Traveled, and Distance Mapped.*
5. Q: What is the difference between Distance Travelled and Distance Mapped (reference #5)?
A: *Distance Travelled shows the total distance the bear traveled during the year(s) it was tracked—providing you with just one number. Distance Mapped allows you to track the bear's distance week by week, showing a number that changes over time.*
6. Q: What is the difference between marginal ice zone and >8/10ths coverage ice? Make sure Ice Layer is loaded (click reference #2) and verify with reference #3.
Definitions:
Marginal Ice Zone is the boundary between the open ocean and ice-covered seas, also the most productive and where the arctic food web primarily exists.
>8/10ths coverage refers to the sea ice concentration in a given area. The >8/10ths sea ice concentration shows where the pack ice covers greater than 80% of the water in a given area. A value of 10/10ths means the region is completely covered by ice.

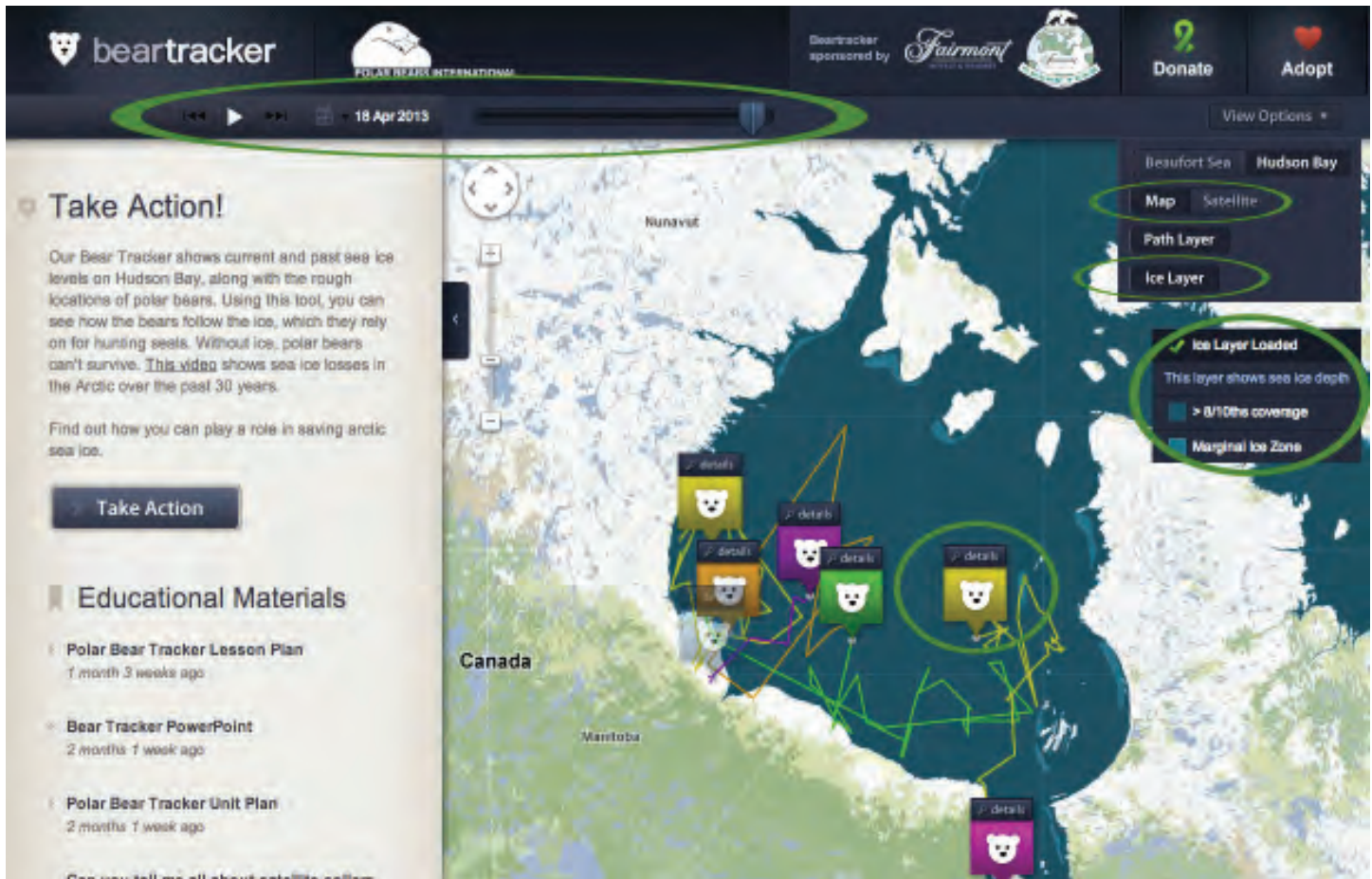


© Dick & Val Beck

7. Q: Track changes in the ice layer through the seasons with ice layers zoomed out. How would you describe the difference between where the marginal ice zone is typically found in relationship to the >8/10ths coverage ice?
A: *The marginal ice zone is found on along the southern edges of the >8/10ths ice. The location of the marginal ice zone and >8/10ths ice changes based upon the season. Polar bear movements can be tracked in relation to where the >8/10ths ice is located.*

Explore the Bear Tracker Worksheet

Welcome to the Polar Bears International© Bear Tracker page!
Please follow along to familiarize yourself with the site.



What is the PBI Bear Tracker?

Our Bear Tracker shows current and past sea ice levels on Hudson Bay along with the rough locations of polar bears. Using this tool, you can see how the bears follow the ice throughout the seasons. They rely on the sea ice for hunting seals, finding mates, and sometimes denning. Polar bears cannot survive without sea ice.

Step 1: Read polar bear scientist Alysa McCall's blog, [Following Bears on the Sea Ice](#), to gain an introduction to how scientists research polar bears through collaring and tracking.

Step 2: Go to the PBI [Bear Tracker](#). Use the circled portions of the map above to guide you through the different tools. Once you have explored the site, see if you can answer the following questions!

Questions:

1. What is the name of the geographic region where polar bears are being tracked?
2. Where is the Hudson Bay population located on the globe? Name the country and bordering provinces.
3. What time frame does the bear tracker cover?
4. What details are provided for each polar bear?
5. What is the difference between Distance Travelled and Distance Mapped?
6. What is the difference between the marginal ice zone and >8/10ths coverage ice?
7. Track changes in the ice layer through the seasons with ice layers zoomed out. How would you describe the difference between where the marginal ice zone is typically found in relationship to the >8/10ths coverage ice?