





Contents

 **TEACHER GUIDE**

- Assessment Rubric 4
- How Is Our Resource Organized? 5
- Bloom’s Taxonomy for Reading Comprehension 6
- Vocabulary 6

 **STUDENT HANDOUTS**
READING COMPREHENSION

- Earth’s Climate 7
- Climate and Human Civilizations 7
- Melting Ice Sheets..... 7
- Sea Level Changes 7
- Extreme Weather 7
- Climate and Human Health..... 7
- Climate and the Economy 7
- Climate and Ecosystems 7
- Hands-on Activities, Writing Tasks 11
- Crossword 15
- Word Search 16
- Comprehension Quiz 17

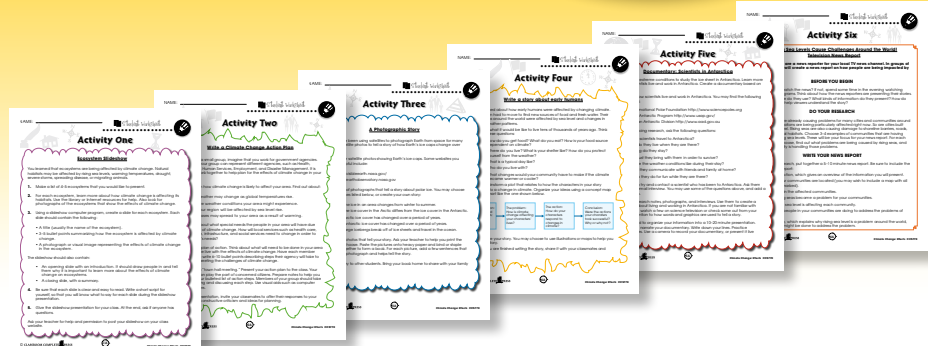
 **EASY MARKING™ ANSWER KEY** 19

MINI POSTERS 21

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Melting Ice Sheets

1. Write each word beside its meaning.

satellite	Arctic	estimate	energy
atmosphere	century	shrinking	heat

- a) The area around Earth's north pole.
- b) The ability to do work.
- c) A period of a hundred years.
- d) The layer of air that surrounds Earth's surface.
- e) An object in space above Earth's surface.
- f) To determine an approximate value.
- g) The energy that matter has due to moving particles.
- h) Becoming smaller.

2. Fill in the chart below with a definition of **absorb** and **reflect** and examples of surfaces that absorb and reflect light.

Term	Definition	Examples
Absorb		
Reflect		



Melting Ice Sheets

Scientists have been measuring the size of Earth's ice sheets for many years. **S**atellites in orbit around Earth take photographs. These show how much area the ice sheets cover. Scientists also drill down into the ice sheets. They find out how deep the ice is in different places. Scientists compare these measurements from year to year. They have discovered that Earth's ice caps are shrinking fast.

The images to the right show how the size of Earth's northern, or **Arctic**, ice cap has changed since 1979. The ice has become thinner in many places, too. Scientists estimate that the polar ice is shrinking by about 12.8% a decade. At that rate, the Arctic will no longer have year-round ice by the end of this century. However, certain processes may actually be speeding up the loss of ice. Scientists are finding that the water from melting ice seeps down to the bottom of the ice layer. The liquid water acts as a lubricant. It speeds up the movement of ice downhill towards the ocean. As ice moves faster, it heats up more and melts faster.



Arctic Ice Cap (image courtesy of NASA)

What happens to the size of Earth's ice caps when global temperature rises?



Melting ice sheets can create **positive feedback**. This is the kind of process that leads to more and more change. Ice **reflects**, or bounces back, sunlight. When large areas of ice disappear, more sunlight is **absorbed**, or taken in, by Earth's surface. Sunlight is the main source of heat energy in Earth's atmosphere. Therefore, melting ice caps create more warming.



Melting Ice Sheets

1. Circle the word **TRUE** if the statement is TRUE OR Circle the word **FALSE** if it is FALSE.

- a) Positive feedback is a kind of change that leads to balance.
TRUE FALSE
- b) Scientists use satellites to measure the size of polar ice caps.
TRUE FALSE
- c) Melting ice caps allow for more sunlight to reach Earth's surface.
TRUE FALSE
- d) Polar ice caps absorb sunlight.
TRUE FALSE
- e) Water from melting ice caps speeds up the movement of the ice.
TRUE FALSE
- f) The Arctic may have no ice in the summers by the end of this century.
TRUE FALSE

2. Put a checkmark (✓) next to the answer that is most correct.

- a) About what percent of the ice caps are melting each year?
 - A 1%
 - B 9%
 - C 12.8%
 - D 79%
- b) What method do scientists use to measure the thickness of the ice caps?
 - A Drilling down into the ice.
 - B Melting ice in a laboratory.
 - C Taking satellite photos of the ice.
 - D Measuring how fast ice moves downhill.
- c) What is the main source of heat energy in Earth's atmosphere?
 - A clouds
 - B sunlight
 - C ice caps
 - D ocean water



Melting Ice Sheets

3. Answer each question with a complete sentence.

- a) Explain how water from melting ice caps speed up the rate at which the ice caps melt.

- b) Explain how a change in the size of ice caps can cause greater warming.

Research

4. How big are Earth's ice caps right now?

Using the Internet, find out what is happening with Earth's polar ice caps right now. Find satellite photos showing Earth's ice caps this year. Compare them with photographs or videos from the past. Read about how much scientists estimate that the ice caps melted during the past year. How does that compare with the estimate of 12.8% melt per decade?

Make a poster showing old and new pictures of the polar ice caps. Use short text to explain how fast polar ice caps are melting. Display the posters around your school.



Model sea level rise.

You will need:

- A clear plastic or glass terrarium
- clay
- string
- water

1. Start by creating a model landscape inside the terrarium. Use clay to model hills, valleys, basins, mountains, and plains. Be sure to include one large basin to model an ocean.
2. Slowly pour water into the main ocean basin. Fill it to a few inches deep, or until it resembles an ocean with a shoreline.
3. Using string, mark the area where the water meets the dry clay, all around your landscape. The string represents the shoreline.
4. If you wish, create small towns and cities in your model.
5. Slowly add more water to your ocean basin. Observe how the shoreline changes as the sea level rises. Add enough water so that your sea level rises at least one inch.
6. Using more string, mark the area where the water now meets the dry clay all around your landscape. This string marks the new shoreline.
7. Observe the differences between the old and new shoreline. What effect did rising sea level have in your model? Were you surprised by the way in which the shoreline changed? Were any areas flooded more than you expected?



Crossword Puzzle!

WORD LIST

climate
desert
economy
ecosystem
forest
fossils
glacier
infrastructure
levee
migrate
permafrost
satellites
sea level
tundra

Across

1. Remains of once-living things preserved in rock.
3. The frozen ground in the tundra.
6. A large mass of ice that doesn't totally melt in summer.
7. A common ecosystem in North America filled with trees.
9. A hot, dry ecosystem.
13. Objects that orbit Earth.
14. When people move from one area to another.

Down

2. The permanent parts of cities.
4. The use of money by a government.
5. This structure is built to help stop flood waters from spreading.
8. Where the ocean meets land.
10. The interaction between the living and nonliving parts of an environment.
11. The average weather conditions over time.
12. The ecosystem in the Arctic and Antarctic.



Comprehension Quiz

Part A

Circle the word **TRUE** if the statement is TRUE OR Circle the word **FALSE** if it is FALSE.

1. Melting ice caps can create a negative feedback cycle.
TRUE **FALSE**
2. Early humans migrated around the globe in response to changes in climate.
TRUE **FALSE**
3. Fossils are the remains in rock of plants and animals that lived a very long time ago.
TRUE **FALSE**
4. Ice sheets once covered Florida.
TRUE **FALSE**
5. Climate change may lead to tropical diseases spreading to more locations.
TRUE **FALSE**
6. Global climate change is causing fewer severe storms to form.
TRUE **FALSE**
7. Ozone cannot harm the lungs of healthy people.
TRUE **FALSE**
8. Ice sheets and permafrost are already melting at a fast pace due to climate change.
TRUE **FALSE**

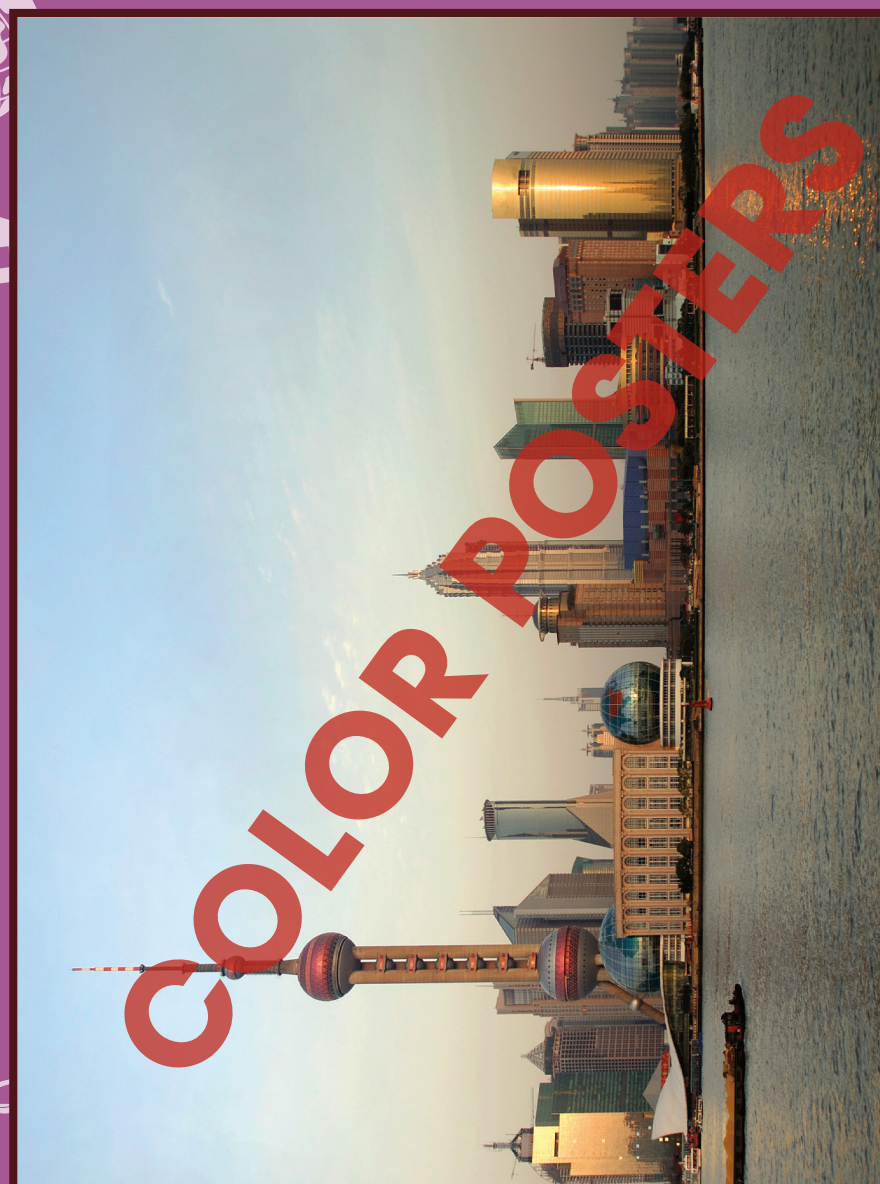
Part B

Label the diagram by doing the following:

1. Label the map of North America with the ecosystems from the list below.
 - 1 desert
 - 2 deciduous forest
 - 3 grassland
 - 4 tundra



Shanghai, China



"Scientists predict that sea levels may rise as much as 26 inches by the end of this century. This will have devastating effects for people living in cities that are built at the ocean's edge."



Melting Ice Sheets



3. Answer each question with a complete sentence.

a) Explain how water from melting ice caps speed up the rate at which the ice caps melt.

b) Explain how a change in the size of ice caps can cause greater warming.

3.

a) Water on the bottom of the ice caps acts as a lubricant. It speeds up the movement of the ice over it downhill and towards the ocean.

b) Ice caps reflect a lot of sunlight back to space. If they shrink, more sunlight will be absorbed by the ground, leading to more warming.

Across:

- 1. fossils
- 3. permafrost
- 6. glacier
- 7. forest
- 9. desert
- 13. satellites
- 14. migrate

Down:

- 2. infrastructure
- 4. economy
- 5. levee
- 8. sea level
- 10. ecosystem
- 11. climate
- 12. tundra

EASY MARKING ANSWER KEY

Research

4. How big are Earth's ice caps right now?

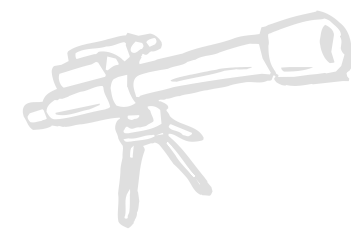
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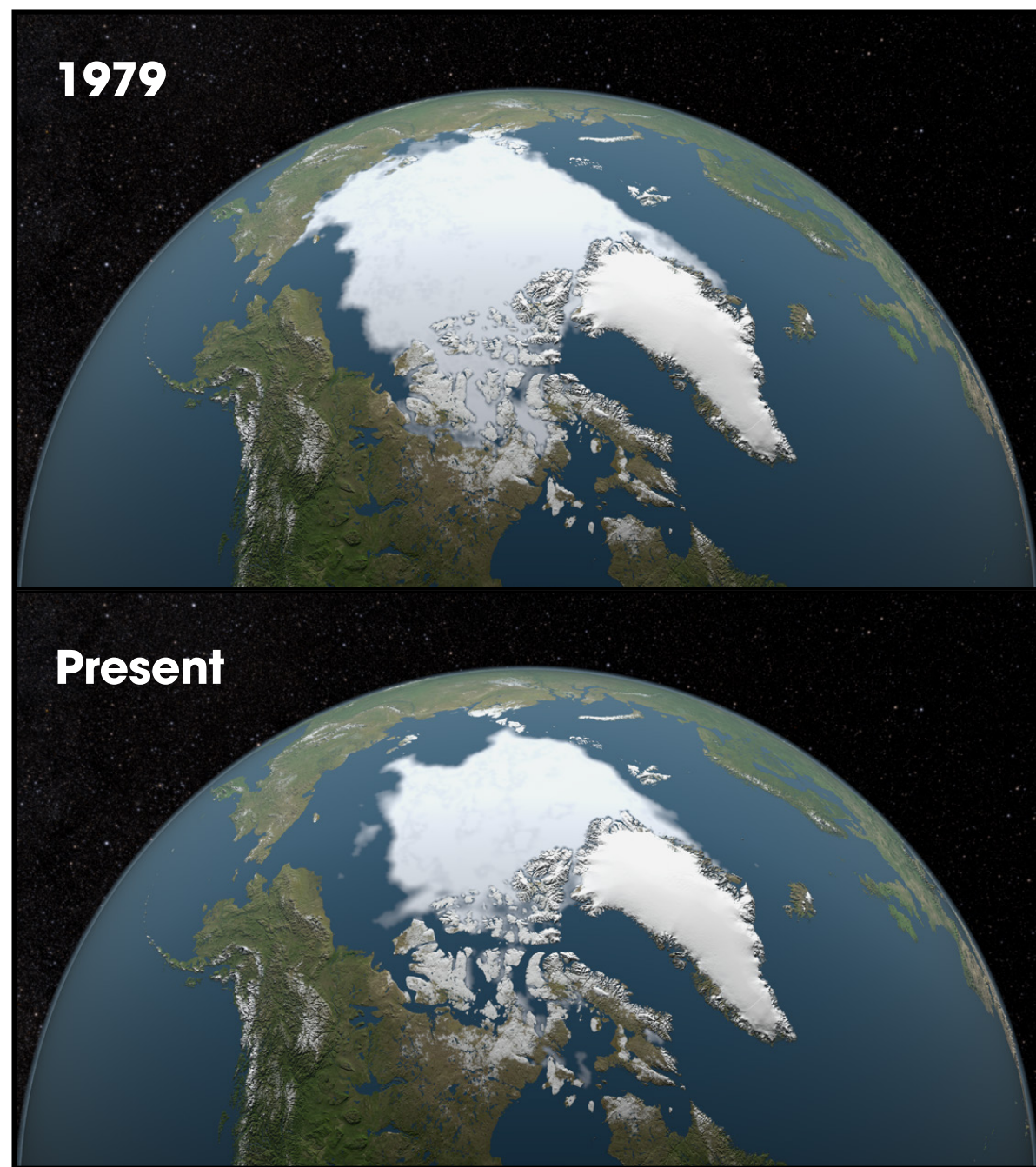


Melting Ice Sheets



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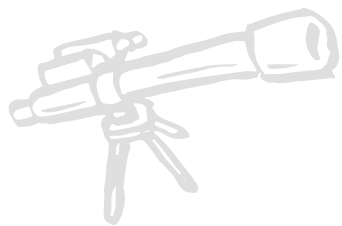


Arctic Ice Cap (image courtesy of NASA)



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