

Dear Educator,

Young people today face a unique challenge of securing a livable planet for tomorrow.

Take your middle schoolers on a virtual trek to explore this issue with **IMAX presents *The Last Glaciers***.

Traveling across several countries over four years, Filmmaker Craig Leeson highlights the impact of human activity and climate change on the world's glaciers, and in turn, the impact changing glaciers have on society.

Empowered with new information and inspired by Leeson's dramatic footage of glacier loss and the resulting effects on sea levels and water availability, students will be able to see specific climate change issues and how to make small, powerful, everyday changes, as well as how to push for big solutions to ensure a healthier planet.

With this free program that supports STEM standards, students will use math and science skills and their own innovation to address the timely issues of climate change.

We hope that you will share this program with other teachers and help raise awareness about the realities of climate change.

IMAX PRESENTS

THE LAST GLACIERS

About IMAX and *The Last Glaciers*

IMAX Corporation is an innovator in entertainment technology, offering immersive film experiences. IMAX endeavors to take audiences to the edge of their seat and into worlds they've never imagined through film events shown around the globe. *IMAX presents The Last Glaciers* is a documentary film highlighting the relationship between climate change, mountain environments and glaciers, and the impact of humans on Earth. IMAX hopes this film will inspire audiences to look carefully at the world around them and make positive changes for the planet.

Target Audience

Students in grades 6-8

Program Components

- A five-page study guide consisting of:
 - This two-page teacher's guide
 - Three reproducible student activity sheets
- Educational standards

What Students Will Learn with These Activities

- Why glaciers are important indicators of climate change
- How climate change indicators around the world affect them
- How small actions can make big changes to climate change and the environment
- Creative and practical ways to improve their world

How to Use the Program

This program can be used before or after viewing *IMAX presents The Last Glaciers* at an IMAX® theatre, or as a self-contained unit. Make photocopies of the three activity sheets. In class, read the instructions and background for each activity. Access to the internet is necessary for the activities.

Activity 1

Tracking Lost Ice

In this activity, students are challenged to use math skills and data interpretation to create a graph of climate change over time and research how it impacts human populations far from glaciers.

Begin the activity by asking students what they already know about climate change. Explain that climate change is rapidly intensifying due to human activity. Increases in carbon emissions have led to global temperature rise, leading to glacial ice loss, rising sea levels, and more frequent and catastrophic weather emergencies.* Guide students to use the data chart in Part 1 to make a visual representation (bar graph) of glacial ice loss over time.

In Part 2, students will color the coastal areas that are projected to be covered in water if climate change continues at the current rate. Divide students into groups and have them find three cities in the impacted zones. Have students research the population of each city and calculate how many people would become climate refugees and have to move. Students can apply what they learn about displaced persons from *IMAX presents The Last Glaciers*. (According to <https://coast.noaa.gov/slr/>, New Orleans, Biloxi, Naples, Miami, Virginia Beach, Washington DC, Annapolis, and Atlantic City are just some of the cities severely impacted by 10 ft. of sea level rise.)

As an extension, each group can contribute to a class world map to share their data. Students can also research states such as Texas, Florida, South Carolina, and Georgia that are already struggling with sunny day flooding/tidal flooding and sea level rise in low lying countries such as the Maldives.

* www.climate.gov/news-features/understanding-climate/climate-change-global-sea-level

A WHOLE NEW PERSPECTIVE

Activity 2

Follow the Water

In this activity, students will connect the information presented in *IMAX presents The Last Glaciers* to a diagram of a glacier and river system. Students will match consequences of lost glacial ice to locations far from the glacier.

Start by showing students the Himalaya glacier and river system on an online map. Several major rivers are fed by Himalayan glacier ice, including the Brahmaputra, Ganges, and Indus. In Part 1 of the activity, students match impacts of lost glacial ice featured in *IMAX presents The Last Glaciers* to a diagram of a glacier and river system.

In Part 2, students explore water scarcity resulting from the disappearing glaciers. Have students use the tips from the activity sheet and their own research about conserving and keeping water clean to create posters and/or social media posts encouraging water stewardship and conservation in school and at home.

As an extension, students can research glacier/river systems around the world to create a climate change impact map to share with others.

Activity 3

Walk Softly, Speak Loudly

In this activity, students will identify small but powerful changes they can make in everyday activities and push for large policies to protect their future. The film emphasizes the urgency of the issue and that getting government officials and companies to change policies is vital to human survival. Tell students that they and their families can also enact everyday changes to help the planet.

Begin the activity by introducing students to the definition of a carbon footprint using a website such as <https://calc.zerofootprint.net/>. With this calculator, students can see how the actions they take every day —

United Nations Mountain Hero & Entrepreneur Malcolm Wood pushes the limits of extreme sports to explore the causes and effects of climate change.

from how they get to school, what they eat, what they wear, and what technology and power they use — impacts the planet. Encourage students to brainstorm ideas for using less and conserving more.

Next, divide students into groups to pledge ways to help the planet. Using information from *IMAX presents The Last Glaciers*, the carbon footprint calculator, and other resources, students will investigate solutions to slow climate change, including lifestyle changes. Students will write alternatives to high carbon footprint activities. Students can use the sidebar for ideas, but also encourage them to use their creativity to innovate additional solutions.

To wrap up the activity, students can craft social media messages or images sharing everyday changes to combat climate change and encourage other young people to share and do the same.

Resources

IMAX presents The Last Glaciers:
thelastglaciersfilm.com/

Climate.gov: climate.gov/news-features/understanding-climate/climate-change-global-sea-level

NOAA: coast.noaa.gov/slr/

EPA: epa.gov/climate-change/what-you-can-do-about-climate-change-water

EPA: epa.gov/watersense/watersense-kids

iEARN: <https://calc.zerofootprint.net/>



TRACKING LOST ICE

Earth is heating at unprecedented rates. The visually-stunning film *IMAX presents The Last Glaciers* documents visual data of disappearing glaciers. Right now, the Antarctic is losing two *Titanics* worth of ice — more than 52,000 tons — every ten seconds, raising sea levels. How has ice loss changed over time? How does it impact human populations?

PART 1

Read the data table below.

Label the x axis with the years.

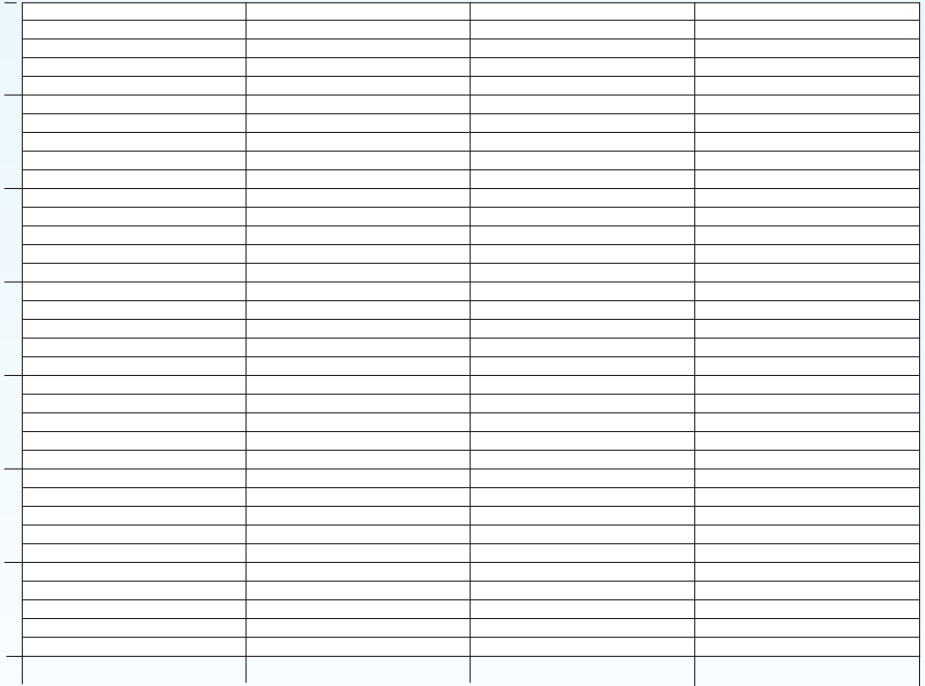
Label the y axis with the amount of ice lost (in inches).

Create a bar graph.

Average Ice Loss from Glaciers¹

Year	Ice Lost
1980s	6.7 inches
1990s	18 inches
2000s	20 inches
2010-2018	33 inches

y-axis



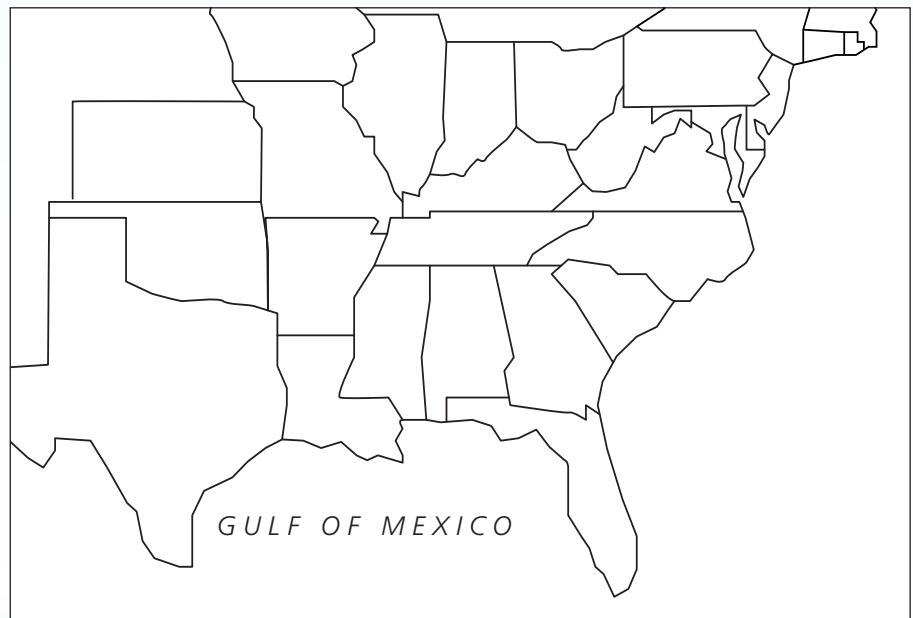
x-axis

PART 2

According to *IMAX presents The Last Glaciers*, 70 percent of the world's fresh water is held in glaciers. If the Antarctic ice melts completely, it will lead to a 50-60 meter (164-196 feet) sea rise.² Use the Sea Level Rise viewer at <https://coast.noaa.gov/slr/> to find cities that would be impacted with a 10-foot rise in sea level.

- Color in the areas on the map that would be underwater.
- Label three cities that would be submerged by sea level rise.
- Research the populations of those cities.

On the back of this sheet, create a chart to show how many climate refugees from each city would need new places to live. What's the total number?



¹ Source: NOAA, <https://www.climate.gov/news-features/understanding-climate/climate-change-global-sea-level>

² Source: *The Last Glacier* (5.08-5.17) Jerome Chappeliez, National Center for Scientific Research



FOLLOW THE WATER

Water lost from glaciers doesn't just raise sea levels. As you'll see in the remarkable *IMAX presents The Last Glaciers*, as glacier water melts, it travels through mountains, valleys, farmland, and coastal areas. A glacier doesn't have to be close to impact human activity.

PART 1

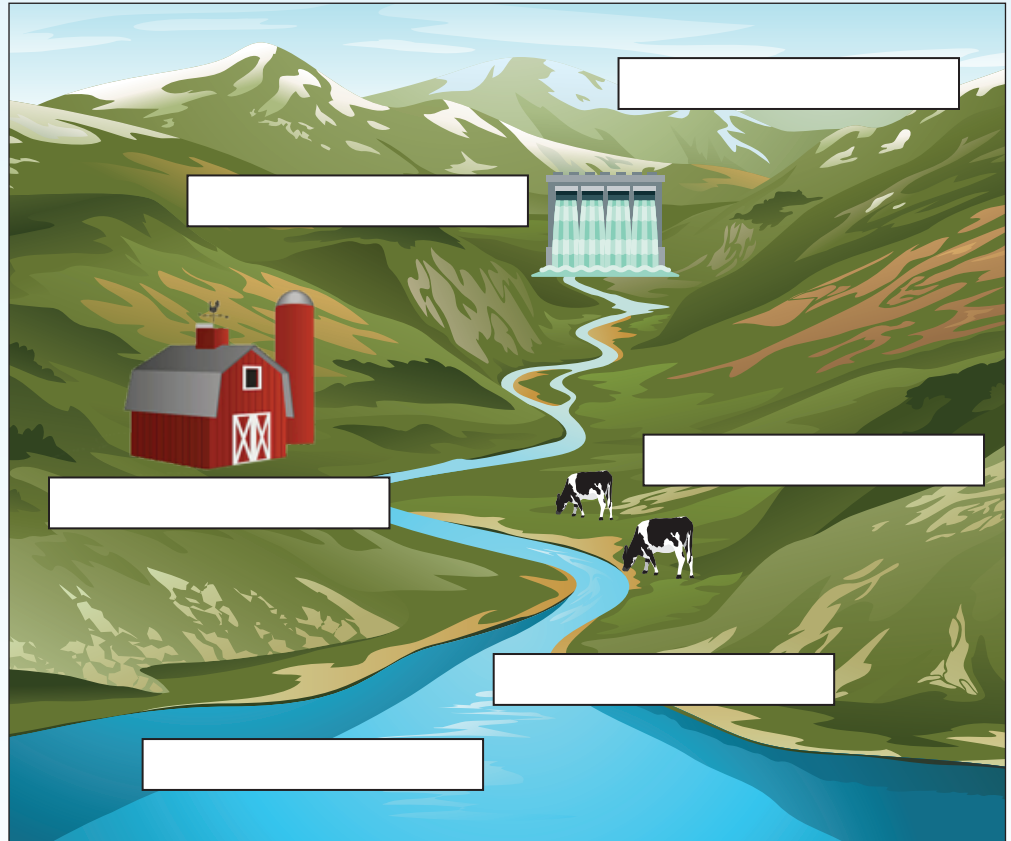
Match the impacts of glacial melt water to locations in this diagram of a glacier and river system.

Examine the glacier and river system.

Label the diagram.

Glacier Loss Impacts

- Loss of farmland/food shortages
- Avalanche risk from melting shelf ice
- Heavy metal in water impacting livestock
- Loss of hydropower
- Fresh water mixing with salt water, water scarcity
- Loss of coastal land



PART 2

Create a poster and/or social media post to encourage water stewardship and conservation in school and at home. Use these tips to help you.

Tips for Conserving Water and Keeping It Clean

- Use an Energy Star® dishwasher instead of hand-washing dishes.
- Run the washing machine with a full load of clothes only.
- Use cold water to wash clothes.
- Take shorter showers.
- Turn off the water when you brush your teeth.
- Fix any leaks, even a small drip over time can add up.
- Use a rain barrel to catch water for watering plants and grass.

WALK SOFTLY, SPEAK LOUDLY

Greta Thunberg is rallying young people to demand action to save Earth from catastrophic climate change. The United States is one of the biggest contributors to carbon emissions. *IMAX presents The Last Glaciers* warns big changes need to be made and made now. You can make everyday changes to make a real difference.



Greta Thunberg and Craig Leeson

Research and brainstorm ways to make your carbon footprint lighter.

Write alternatives to high carbon activities in the graphic organizer below. Try to add at least two ideas for each carbon-heavy activity. Can you come up with more?

Pledge to make at least two changes to your daily behavior.

Encourage a family member or friend to join you.

Carbon-heavy Activity	Alternative Option	
Driving to school		
Washing clothes each time you wear them		
Buying new clothes		
Using single-use plastic water bottles		
Buying fast food or food in single use plastic containers		
Using plastic bags while shopping		
Your idea:		
Your idea:		

Tips to Help Lower Your Carbon Footprint

- Walking or riding a bike to school releases the best amount of carbon, none! School too far away? Arrange a carpool to lower carbon emissions.
- Food packaging releases a lot of carbon dioxide into the atmosphere. Sometimes it's hard to avoid, but you can use the packaging again or recycle.
- Wearing clothes more than once cuts down on water usage. When you do laundry, make sure the washer is full, and set it to use the least amount of water. Try to air dry laundry when possible.
- Try to use sturdy, reusable water bottles, but even single-use plastic water bottles can be reused. Fill it up again or make it into a planter and grow some green.
- You've heard reduce, reuse, recycle. This goes for clothes, too. Wear what you have. Want something new? Organize a clothing swap with friends or go thrifting.

CODE RED

"This is code red. There are no more chances. If we don't tackle the situation right now, we won't have a future. It's as simple as that."

— Filmmaker Craig Leeson,
IMAX presents The Last Glaciers

IMAX PRESENTS THE LAST GLACIERS

EDUCATION STANDARDS

Next Generation Science Standards* - 6-8	Activity 1 2 3
Earth and Human Activity	
MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects	• • •
MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment	• • •
MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	• • •
MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.	• • •
MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	• •
Related Skills – Common Core State Standards Connections, ELA/Literacy	
RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-1), (MS-ESS3-2), (MS-ESS3-4), (MS-ESS3-5)	• • •
RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS3-2)	• • •
WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-ESS3-3)	• • •
WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS3-3)	• • •
WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-1), (MS-ESS3-4)	• • •

Common Core Math Standards** - Grade 6	Activity 1 2 3
Mathematical Practices	
1. Make sense of problems and persevere in solving them.	• •
2. Reason abstractly and quantitatively.	• •
3. Construct viable arguments and critique the reasoning of others.	• •
4. Model with mathematics.	• •
5. Use appropriate tools strategically.	• •
6. Attend to precision.	• •

Common Core Math Standards** - Grade 7	Activity 1 2 3
Mathematical Practices	
1. Make sense of problems and persevere in solving them.	• •
2. Reason abstractly and quantitatively.	• •
3. Construct viable arguments and critique the reasoning of others.	• •
4. Model with mathematics.	• •
5. Use appropriate tools strategically.	• •
6. Attend to precision.	• •

Common Core Math Standard** - Grade 8	Activity 1 2 3
Mathematical Practices	
1. Make sense of problems and persevere in solving them.	• •
2. Reason abstractly and quantitatively.	• •
3. Construct viable arguments and critique the reasoning of others.	• •
4. Model with mathematics.	• •
5. Use appropriate tools strategically.	• •
6. Attend to precision.	• •

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