

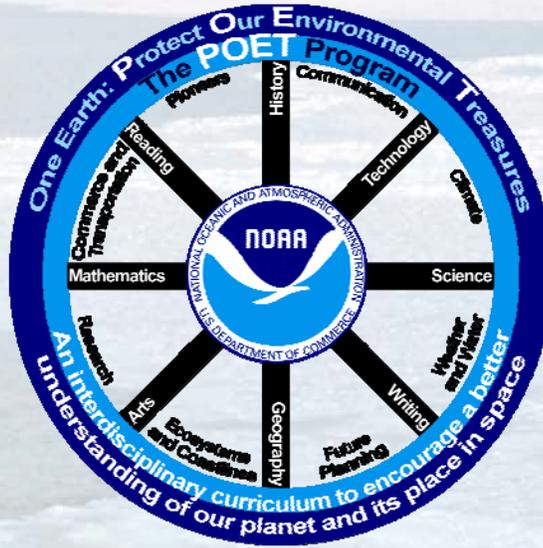
Arctic Sea Ice

Category

History, Technology,
Mathematics, Science,
Art

Real World Connection

Future Planning,
Coastal Areas,
Climate, Research



Materials

Calculator, Scissors,
Heavy Duty Stapler

Maps of Arctic Sea
Ice Extent –
1979 to Present
(Included)

Paper Cutter
(Optional)

Problem Question

How has the area of Arctic sea ice changed over recent years?

Prior Knowledge What I Know

Based on your prior knowledge, answer the problem question to the best of your ability.

Conclusion What I Learned

Answer the problem question after completing the activity. Include an example in your answer.

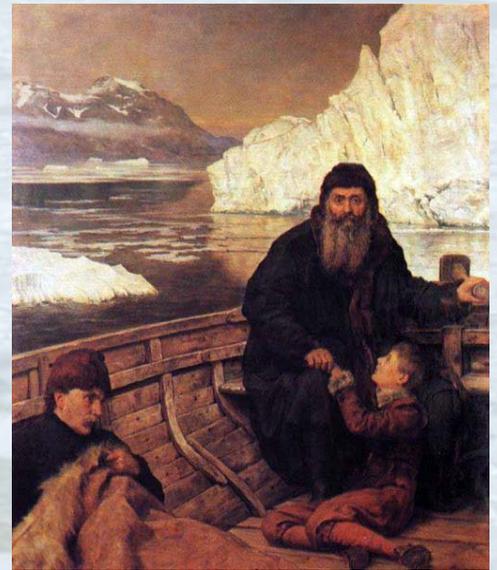
Background

A long-time dream of explorers, ruling monarchs, and ordinary people seeking the riches of global trade might come true! For centuries, explorers hoped to find a faster shipping route between the Atlantic and Pacific Oceans. By cutting-short shipping times, merchants can get their products to markets faster, and therefore make a quicker profit. But bitter cold and ice-packed seaways proved to be an insurmountable barrier.

The search for a polar route through what is now Canada intensified as colonists populated North America. Known as the **Northwest Passage**, a long line of spirited adventurers braved the extreme cold hoping to find a northern water route connecting the Atlantic and Pacific Oceans. At the time, the only route to Asia was south around the the Cape of Good Hope, Africa or Cape Horn, South America. Both routes traversed treacherous seas.

Among the hopeful navigators in the early 1600's, **Henry Hudson**, an English explorer, sailed north and west toward the North Pole from Europe on four different occasions. Hudson sailed under flags of different countries, whoever would finance his adventure, looking for a short-cut from Europe to the riches of the Orient. Each time he was defeated by the cold and seemingly endless expanses of ice.

On his last trip, Hudson sailed deep into what is now the United States and Canada without success. Hudson's crew wanted to return home to Europe. When Hudson refused, the crew mutinied. The angry sailors put Hudson, his teenage son, and the sailors loyal to him into a small boat with no supplies. Clearly meant to die in the frigid wilderness, Hudson and his fellow passengers were never seen again.



Although Henry Hudson failed in his attempt to find a northwest passage to the Far East from Europe, he succeeded in exploring vast areas of the North Atlantic and, therefore, played a major role by setting the stage for the colonization of North America. Hudson established friendly trade with the Indians, helped to establish New Amsterdam (New York) and explored the river that bears his name. Sadly, records of his voyages, including his original notes, were scattered about after his untimely death. **The Arctic sea ice prevailed!**



Background – Continued

Not until the early 1900's did an expedition successfully navigate the Northwest Passage. Norwegian polar explorer, **Roald Amundsen**, in a specially outfitted steel seal hunting ship, successfully completed the route. It took three years!

Today, melting ice has rekindled interest in the Northwest Passage, now called the **Northern Sea Route**. As Earth's atmosphere warms, interest in claiming shipping rights is heating up among different countries. Debate is escalating among government leaders, especially those whose countries are within the **Arctic Circle**. Not only would the amount of time for shipping goods between oceans be shortened, but shipping distance for natural resources like oil and gas from the Arctic to the U.S. and Europe would be less, thus reducing wear and tear costs related to transport.

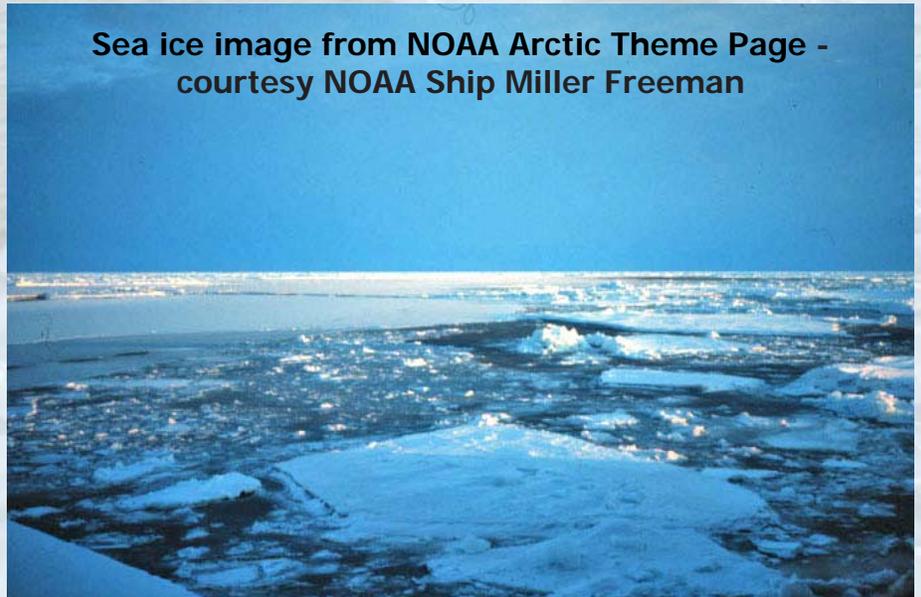
Just as monarchs of old competed to find a northern water route between the Atlantic and Pacific Oceans, world leaders of today compete for the right to use the emerging waterway created by a sudden and mostly unanticipated warming climate. If only those early explorers could see satellite images of the Arctic ice melting, opening the once treacherous and impossibly passable Northwest Passage – **as we watch!**

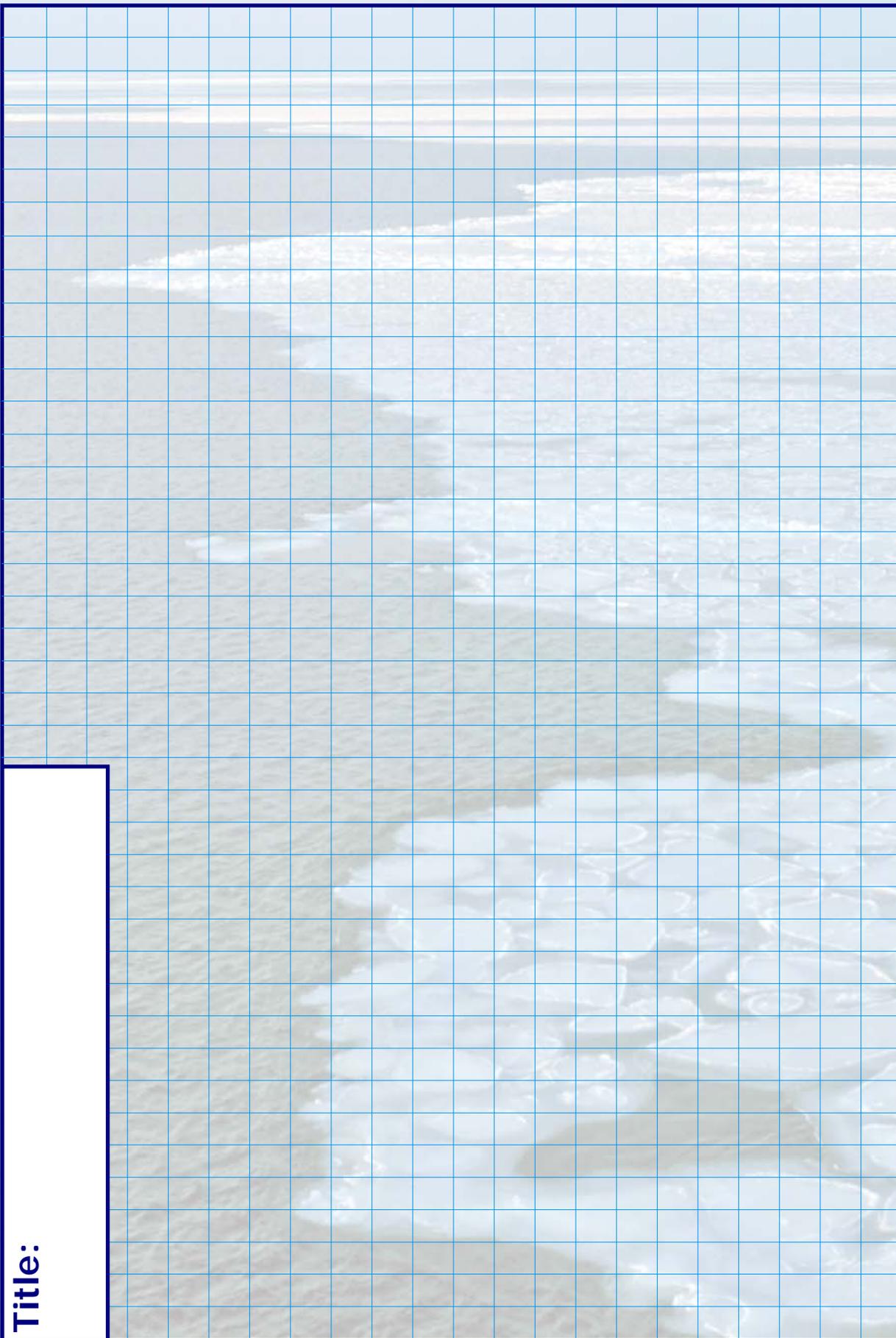
Procedure - Part 1

Graph the area (extent) of Arctic sea ice (measured in millions of square miles) over time from 1979 to 2007. Use the series of small images of the Arctic sea ice extent on the pages at the end of this activity, where you will find total sea ice extent information.

1. On the X-axis of Figure 10-1, starting with 1979, number each year up to 2007. Label the X-axis.
2. On the Y-axis of Figure 10-1, starting with 4.0, number to 8.0, counting by two-tenths.(4.2. 4.4, 4.6, etc.). Label the Y-axis.
3. Use the series of small images of the Arctic sea ice extent on the pages at the end of this activity, to find the data that you need, plot the points (extent in millions of square miles for each year). Each image represents a different year.
4. Draw a curve of "best fit" through the plotted points in your graph. Try to capture all the ups and downs of the data points with your curve.
5. Now connect the first point (1979) and the last point (2007) with a straight line to obtain a trend line. Some of all the other points should be above this line and some should be below it.
6. Now on the X-axis, starting with 2007, extend the numbering of years out to 2018.
7. Now extent your line of "best fit" out to 2018 based on the line pattern that you see.
8. Now extend your trend line from 2007 to 2018 and draw a second trend line from 2007 to 2018. Compare the lines to get a feel of predicting future sea ice extent.
9. Write a title for your graph in the area provided.

Sea ice image from NOAA Arctic Theme Page -
courtesy NOAA Ship Miller Freeman





Title:

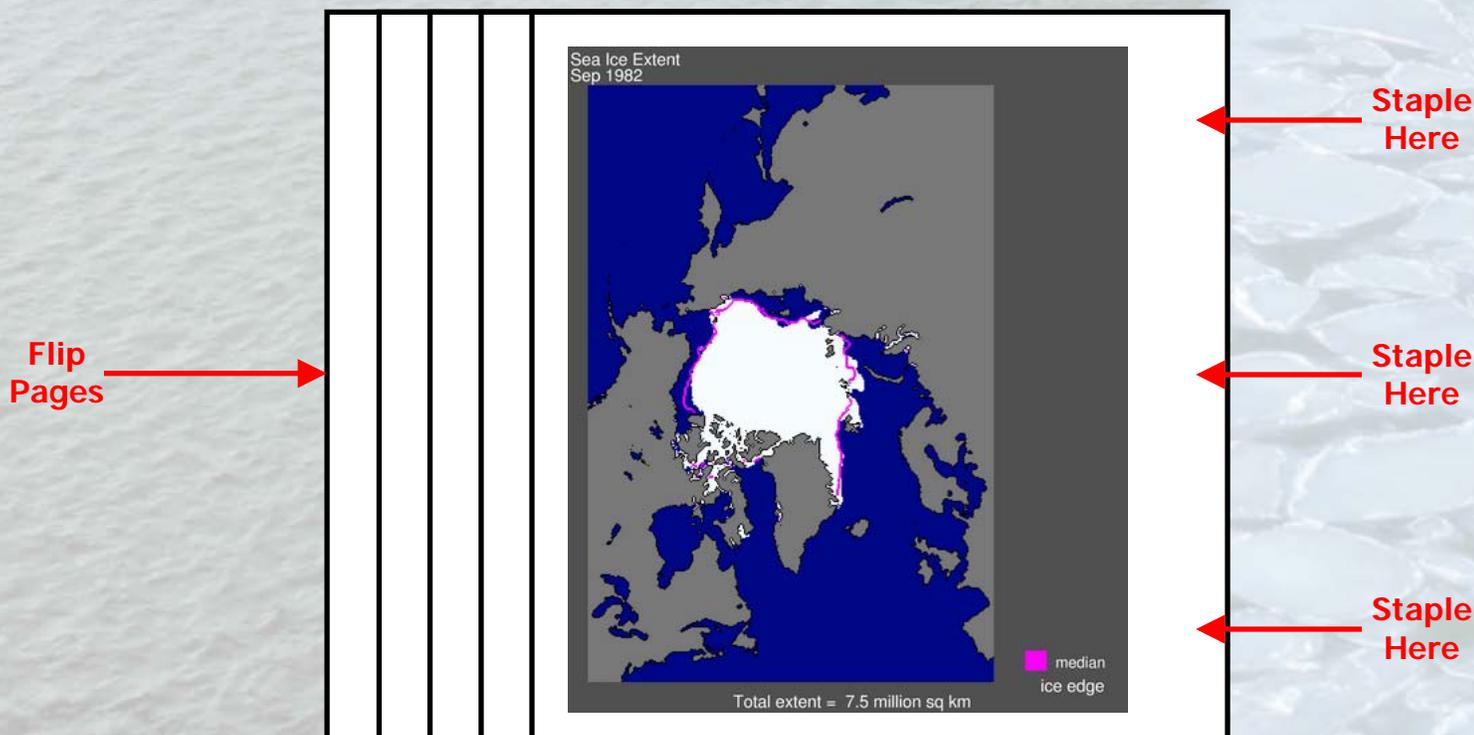
Figure 10-1. Blank graph for labeling the X-axis, labeling the Y-axis, plotting sea ice extent data, drawing a curve, and tilling the figure.

Procedure – Part 2

Make a “flip” book, an animation to simulate the sea ice change between 1979 and 2007. Use the images on the next pages to create your book.

1. Cut-out each individual image. Be sure to **cut each image the same size along the red dashed lines**.
2. Chronologically, assemble the images into the pages of your book, with the most recent image on the **bottom**.
3. Holding the pages so that the side that will open is facing downward, gently tap the pages on a table so that all of the pages are evenly aligned on the side that will be flipped. The other sides need not be so carefully aligned.
4. Staple the side opposite the flip side together with two or three staples. Note that there is a dark colored blank to place the staples. Be careful to keep the pages on the side that you will flip as even as possible. If the pages become uneven after stapling, then carefully trim with a paper cutter. (Use a paper cutter under the supervision of an adult or ask an adult to do it for you.)
5. Flip the pages several times to “loosen-up” your flip book. If pages stick together, carefully separate them and flip several more times.

Voila!



Questions – Parts 1 and 2

1. Why did people want to find a Northwest passage?



2. What prevented explorers from finding a Northwest Passage?



3. Although Henry Hudson failed to find a Northwest Passage, his name is part of American history. Explain.



4. Rounded to the nearest hundred years, what is the mathematical range between Henry Hudson's exploration and Roald Amundsen's successful trip through the Northwest Passage?



5. Between what two years is the greatest decrease in Arctic Sea ice?



6. Why is the data collected in September for each year?



7. Extend your "line of best fit" with a dashed line to predict the extent of Arctic Sea ice in 2018, if the current trend continues.



8. In what year might Henry Hudson sail, unobstructed by Arctic Sea ice, to the Orient from Europe if the current trend continues (Arctic Sea ice disappears)?



9. Why should we be concerned about Arctic Sea ice melt?

