name:
section:

Instructions to accompany this activity sheet can be found online at:
http://serc.carleton.edu/eet/seaice/index.html

Students who complete this lesson will know and be able to do:

- Measure the seasonal variations in sea ice extent
- Discover long-term changes occurring in sea ice extent
- Visualize the relationship between sea surface temperature and sea ice extent
- Grasp the complex linkage between the sea-ice extent to the Arctic food web and human activities
- Download tabular and image data related to sea ice extent and temperature
- Manipulate image data with digital image processing tools
- Animate a stack of images
- Plot tabular data as graphs and examine trends to make predictions

Read the Background Information Page and answer the following questions.
(*on the teacher page*)

1. List three impacts of the loss of sea ice. In each case, explain what system is being impacted and give details and examples.

2. What animals depend on sea ice to breed? Name two and explain their role in the marine ecosystem.

Read the Sea Ice Primer to answer the following questions.
(*a link from the background page*)

3. What is sea ice and how does it form?

4. Describe the difference between single and multi-year sea ice.

5. What is albedo and how does sea ice help to regulate climate?

6. How do the native peoples of the Arctic depend on sea ice for their existence?

Read the Case Study Page and answer these questions

7. Who is Dr. Meier?

8. What tools does he use to study sea ice?

9. Why is he concerned about the changes that he sees?

Part 1. Download data and Image J software

10. After downloading the data sets from NASA, browse through the files in the folder "monthly".

What are the first and last file names? Copy the names here.

What information is in these file names? (hint: look at the instructions for this information.)

Part 2. Import, Animate and Measure.

Step 1.

11. After importing and animating the datasets, describe your general impressions of the seasonal changes in the sea ice.

Step 2.

12. What is the purpose of a look-up table (LUT )?

13. Describe other places where you might have used a similar tool.

Step 5.

14. Read the text from Dr. Meier. Why do we use extent rather than concentration for our measurements?

15. Why is concentration also an important factor to discuss when talking about the decline in sea ice? (hint: return to the Sea Ice Primer and study the section on multi- year ice)

Part 3. Import and Process the data in Excel

Step 3.
16. Graph the data from this step. Sketch or paste your graph here.

17. What does the data say? Is the sea ice extent really getting smaller in November of each year? Is it true that polar bears are having to wait longer for the ice to return to Hudson Bay?

18. What does the general slope of your trend line say about sea ice in Hudson Bay since 1979? Describe the relationship shown by your trend line.

19. At the rate of decline shown by your chart, how much ice would you predict will be in Hudson Bay in November, 50 years from now?
Explain how you arrived at this answer.

Part 4. Arctic Temperature Trends.

20.Plot your data and examine the trends. Sketch or paste your graph here:

21. What does your trend line say about November temperatures from 1978 to 2006? Describe the relationship shown by your trend line.

22. Describe the relationship you see between the 2 datasets, temperature and sea ice extent.

Part 5. Check the trends elsewhere in the Arctic.

23 -25. Select one more village to examine from the suggested list, or pick your own area of interest. Plot both the sea ice extents and temperature trends for this region. Sketch or paste your graph here and describe what you see.