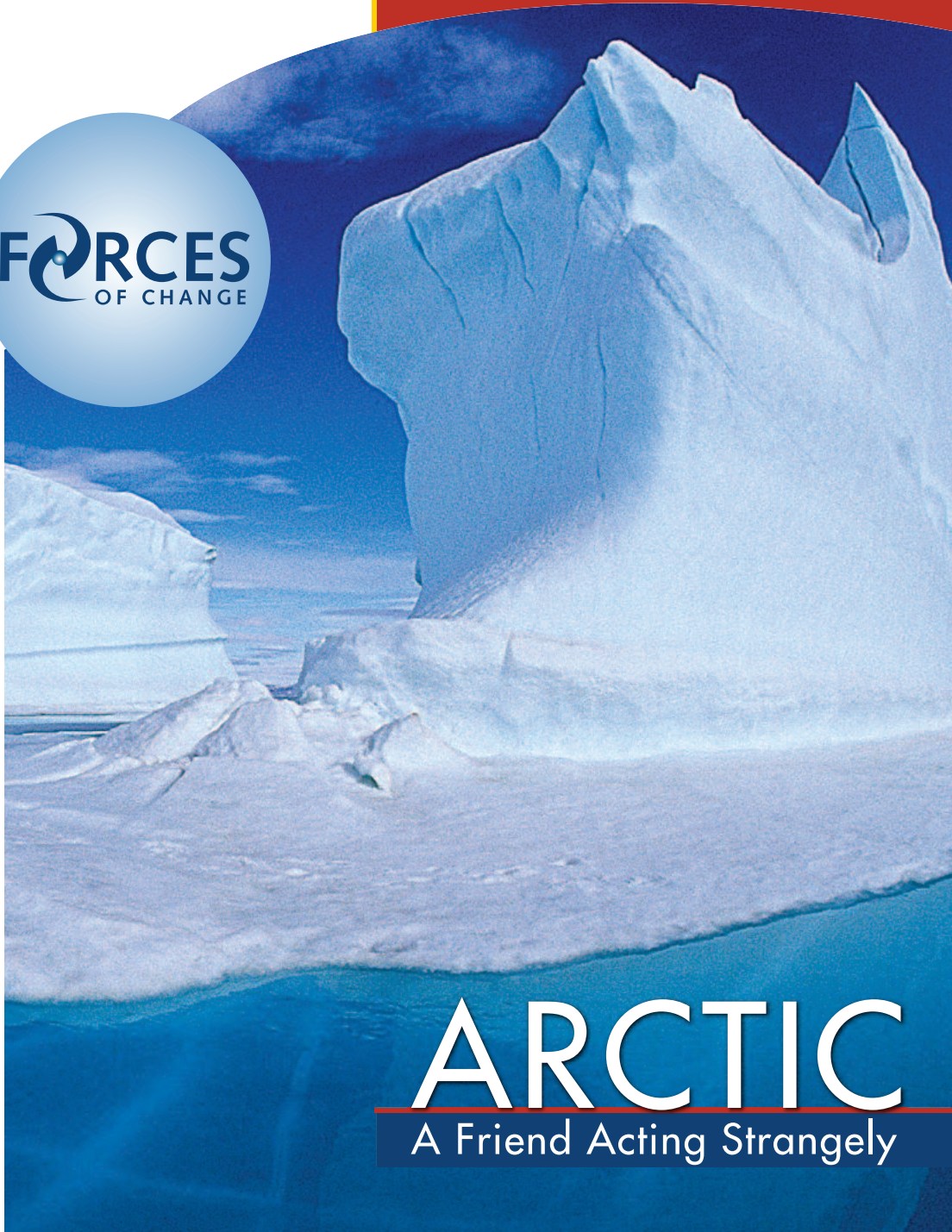


**Activity 1**  
Eyewitnesses to Change



# ARCTIC

A Friend Acting Strangely



Smithsonian  
*National Museum of Natural History*

## ACTIVITY 1

# EYEWITNESSES TO CHANGE

NATIVE PEOPLES OBSERVE CLIMATE CHANGES IN THE ARCTIC

### Living With Change Sachs Harbour, Canada

Led by Rosemarie Kuptana—pictured here with her mother, Inuit elder Sarah Kuptana—the Inuit community of Sachs Harbour initiated a two-year project to document their observations of Arctic climate change.

Photo from *The Earth Is Faster Now* (2002)



### OVERVIEW

Students explore recent changes in the Arctic's climate that have been observed and documented by indigenous Arctic residents. Students watch a video, take notes, and create a concept map. Students also examine historical weather data for an Arctic community.

### SUGGESTED GRADE LEVEL

5 – 8

### ALIGNMENT WITH NATIONAL STANDARDS

*National Science Education Standards*

- Abilities necessary to do scientific inquiry
- Structure of the earth system
- Earth's history
- Populations, resources and environments
- Natural hazards
- Science as a human endeavor
- Nature of science

### ESTIMATED TIME

1. Two 45-50 minute class periods (for 42-minute video)
2. One 45-50 minute class period (for 14-minute video)
3. One 45-50 minute class period for Extension Activity

### MATERIALS

- Access to the Internet
- Computer with projector or video equipment
- Activity Sheet A
- Large index cards or large-size Post-It® notes
- Graph paper (for Extension Activity)

## ACTIVITY 1

### OBJECTIVES

Students will be able to:

- 1 > Effectively take and organize notes.
- 2 > Prioritize concepts and map cause and effect relationships among them.
- 3 > List five changes in climate the people of Sachs Harbour have observed.
- 4 > Explain why the people of Sachs Harbour are critical observers of their environment.
- 5 > Compare and contrast indigenous observations of climate to historical weather records.



#### Documenting Change Sachs Harbour, Canada

This Canadian Arctic community co-produced a broadcast-quality video to bring attention to the impacts of climate change on their lives.

Photo © Neil Ford

### BACKGROUND

For thousands of generations, native residents of the Arctic have lived with year-to-year fluctuations in their environment and weather. But in recent decades, they have observed changes that are far different from what they would consider normal. The video—*Alangotok—Inuit Observation on Climate Change*— documents climate change from the perspective of an indigenous Arctic community. It was produced by the residents of Sachs Harbour, an Inuit

community. Sachs Harbour is located on Banks Island in Canada's Northwest Territories, in the High Arctic about 640 kilometers (400 miles) above the Arctic Circle. The video was part of a community-based project conducted in partnership with science researchers.

Projects like the one carried out in Sachs Harbour involve Traditional Ecological Knowledge (or TEK), a system of an understanding one's environment. It's an oral tradition accumulated over many, many generations by people who depend on the land and sea for their survival. Increasingly, climate specialists rely on these oral "climate records" to determine the scope and impact of changes in the Arctic.

# ACTIVITY 1

## PROCEDURE

### STEP 1 > Download the video.

Download the video from the Internet, or purchase a copy for \$16. You have several options.

- At <http://www.iisd.org/publications/pub.aspx?pno=429> there is a 42-minute and a 14-minute version of the video: *Alangotok—Inuit Observation on Climate Change Sila, Alangotok—Inuit Observation on Climate Change*.
- At <http://forces.si.edu/arctic/> is a 3-minute video, *Eyewitness to Change*, that is an adaptation of the video above used in the exhibit, "Arctic: A Friend Acting Strangely."

### STEP 2 > Introduce the activity.

Tell students they are going to watch a video about climate change in the Arctic, produced by the Inuit community of Sachs Harbour in Canada's Northwest Territories. The residents of Sachs Harbour made the video to call attention to their concerns about the effects of changes in the weather and environment on their lives.

The community of Sachs Harbour largely supports itself—as most indigenous Arctic communities do—through hunting, trapping, and fishing. Ask students how this fact might make a community more or less (1) astute observers of changes in their environment and (2) vulnerable to the changes in their climate.

### STEP 3 > Watch video and take notes.

Students take notes during the video. On **Activity Sheet A**, each student:

- Records 10 observations made by the residents of Sachs Harbour.
- Organizes the 10 observations into four categories of "observed changes" (1) Weather and Seasons (2) Land and Sea (3) Animals (4) Community Life. (*Extension for advanced classes or higher grades: students create their own categories based on the observed changes and then organize the observations into the correct categories.*)

See Teacher Reference #1

### STEP 4 > Small group discussion and consensus.

Divide class into groups of four students each to discuss the video. Distribute 10 large index cards to each group. Each group:

- 1 > Appoints a recorder for its group.
- 2 > Agrees on the 10 most important observations made by the residents of Sachs Harbour.

## ACTIVITY 1

*See Teacher Reference #2*

- 3 > Records each observation onto an index card.
- 4 > Sorts each card into one of four categories of “observed changes,” as in Step 3: (1) Weather and Seasons, (2) Land and Sea, (3) Animals, and (4) Community Life.
- 5 > Writes one of the four categories on each of the ten index cards.

### **STEP 5 > Class creates a concept map.**

- 1 > Assemble the class to create a concept map. The concept map will show hierarchies and cause/effect relationships among the observations made by the residents of Sachs Harbour.
- 2 > Tack up the index cards produced by the small groups in Step 4.
- 3 > Organize cards into the four categories of observed changes. Eliminate duplicate concepts. Combine similar concepts onto one card.
- 4 > Organize index cards into main groups and then into sub-groups. (You do not have to be tied to the four initial categories. Students probably discovered that some of the observations do not fit neatly into a category, there are complex relationships among the observations.)
- 5 > Arrange the index cards in a layout that best represents the hierarchies and connections among the main groupings and sub-groupings. Use a consistent hierarchy in which the most important groups are at the top or in the center your layout. Place closely related items near each other. Think in terms of connecting the items that shows the relationships among them. Remember there are many ways to create this concept map.
- 6 > Use lines or arrows to link groups and sub-groups.
- 7 > Have students copy the concept map onto the back of **Activity Sheet A**.

## **ASSESSMENT**

### **Discussion questions (can be used in discussion groups or as written essays).**

- 1 > Ask students: “If you lived in Sachs Harbour would you be concerned about the changes observed? What would concern you the most and why?”
- 2 > Why is it important to the people of Sachs Harbour to be able to reliably predict the weather and seasonal changes?

## ACTIVITY 1

- 3 >** What people in your community, do you think, might be particularly keen observers of the climate and environment? (Examples might include: farmers, road workers, fishermen, resort owners).
- 4 >** Why can these observations by local Arctic residents be useful to scientists who study climate change? What can scientists learn from the people of Sachs Harbour about changes in their environment?

### Comparison of data and observations

Students compare historical temperature records for Sachs Harbour with observations made by the community's residents.

#### See Teacher Reference #3

- 1 >** Students create a line graph to express annual average temperatures for Sachs Harbour from 1956-2005, a 49-year period (*Extension for advanced classes or higher grades: students should research the data on the Internet and then create a graph based on datasets they locate through their research*)
- Years are on the "X" (horizontal) axis
  - Annual mean temperatures are on the "Y" (vertical) axis.
- 2 >** Using their graphs as reference, students complete the following statement:
- From 1956-2005, the average annual temperature for Sachs Harbour seems to have \_\_\_\_\_ (increased/ decreased/ stayed about the same).

## RESOURCES

### 1 > Traditional Ecological Knowledge (TEK):

- Krupnik, Igor and Jolly, Dyanna (eds.) 2002. *The Earth is Moving Faster Now: Indigenous Observations of Arctic Environmental Change*. Fairbanks, Alaska: Arctic Research Consortium of the United States
- [http://www.edu.gov.mb.ca/k12/docs/support/sila\\_video/](http://www.edu.gov.mb.ca/k12/docs/support/sila_video/)

### 2 > Concept mapping:

- <http://www.udel.edu/chem/white/teaching/ConceptMap.html>

### 3 > Historical weather records:

- NASA Institute for Space Studies (GISS): [http://data.giss.nasa.gov/gistemp/station\\_data/](http://data.giss.nasa.gov/gistemp/station_data/)
- Meteorological Service of Canada: [http://climate.weatheroffice.ec.gc.ca/climateData/monthlydata\\_e.html?timeframe=3&Prov=CA&StationID=1794&Year=1956&Month=1](http://climate.weatheroffice.ec.gc.ca/climateData/monthlydata_e.html?timeframe=3&Prov=CA&StationID=1794&Year=1956&Month=1)

# ACTIVITY 1 > EYEWITNESSES TO CHANGE > ACTIVITY SHEET A

Student Name \_\_\_\_\_

## STEP 1 > Take notes

While you watch the video list ten changes observed by the residents of Sachs Harbour.

1 > \_\_\_\_\_

2 > \_\_\_\_\_

3 > \_\_\_\_\_

4 > \_\_\_\_\_

5 > \_\_\_\_\_

6 > \_\_\_\_\_

7 > \_\_\_\_\_

8 > \_\_\_\_\_

9 > \_\_\_\_\_

10 > \_\_\_\_\_

## STEP 2 > Organize your notes

After you watch the video, organize your notes in the four categories below. Write the # of each observed change you recorded below in the category you think it belongs. You may think some observations belong in more than one category. That's okay.

## STEP 3 > Summarize

**Changes in the  
Weather and Seasons**

**Changes in the  
Land and the Ocean**

**Changes in  
Animal Life**

**Changes in  
Community Life**

|       |       |       |       |
|-------|-------|-------|-------|
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ |

Select two changes that you think would concern you the most if you lived in Sachs Harbour. Explain why.

\_\_\_\_\_

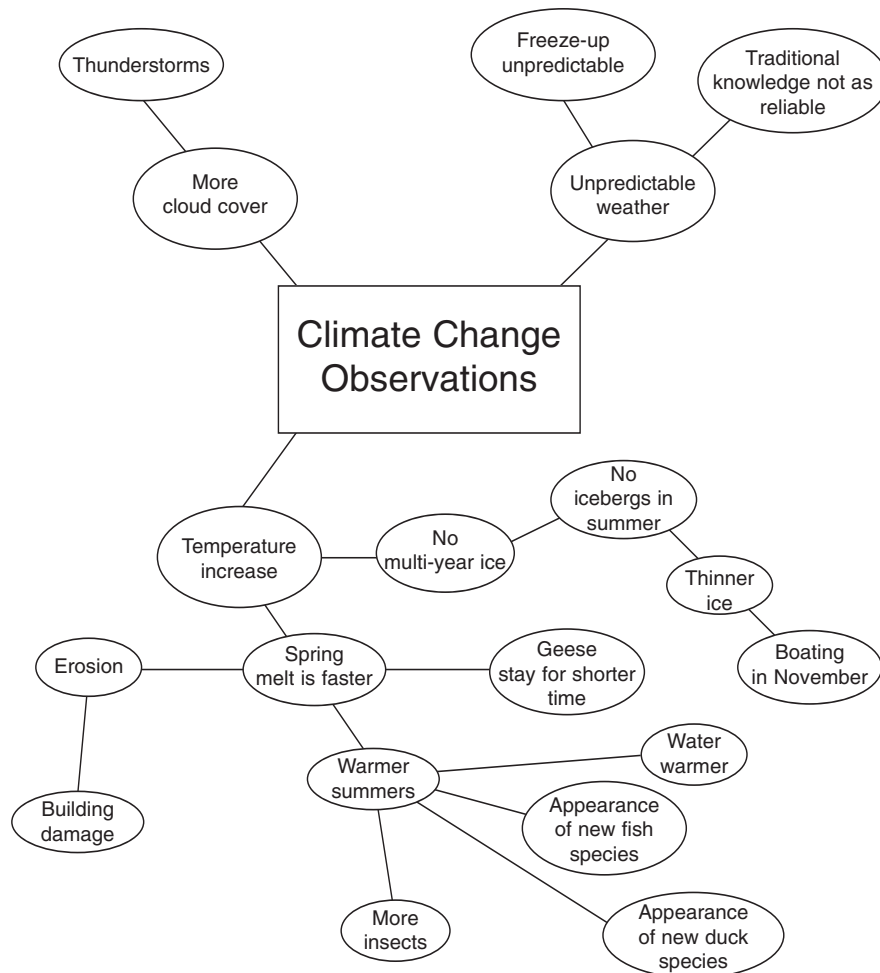
\_\_\_\_\_

# ACTIVITY 1 > TEACHER REFERENCES

## Teacher Reference #1: Changes Observed by Residents of Sachs Harbour

| Weather and Seasons                     | Land and Sea  | Fish and Wildlife                            | Community Life                               |
|---|---|--|--|
| Longer, warmer summers                  | Less sea ice in summer  | More skinny seals (mothers abandon babies)   | Don't know when to travel                    |
| More summer rain and wind               | Earlier break-up of sea ice in spring and later freeze-up in autumn     | New fish species, e.g. salmon (warmer water) | Can't read weather like used to              |
| Earlier springs                         | Thinner sea ice   | Fewer polar bears (less ice)                 | May have to move community (due to erosion)  |
| Shorter, warmer winters                 | Sea ice cracks more.  | Geese stay for shorter time in spring.       | Food sources moving further and further away |
| Later autumns                           | Increased landslides and mudslides                                      | More insects in summer                       | Traditional knowledge not as reliable        |
| Seasonal change becoming unpredictable. | No icebergs in summer   | New duck species appearing                   | Damage to buildings                          |
| Rain instead of snow in autumn          | Onset of autumn freeze-up is unpredictable.                             | Change in caribou migration                  | Don't know when to travel                    |
| More intense wind storms.               | More erosion  |  | Boating in November                          |
| More cloud cover                        | Melting permafrost  |  | Swimming in the ocean                        |
| Faster Spring ice and snow melt         | Warmer ocean water  |  |  |
|   | Melting permafrost caused lake to drain into ocean taking fish with it. |  |  |

## Teacher Reference #2: Sample Concept Map





# ACTIVITY 1 > TEACHER REFERENCES

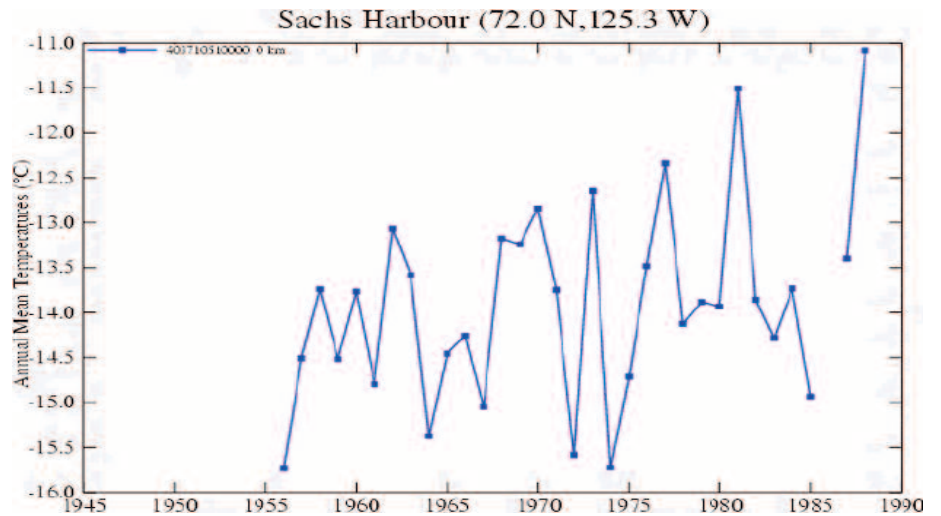
## Teacher Reference #3: Using Datasets to Create a Line Graph

### Sachs Harbour Annual Mean Temp.

(data from the Meterological Service of Canada)

| Year | Temp. (°C) |
|------|------------|
| 1956 | -15.4      |
| 1957 | -14.7      |
| 1958 | -13.3      |
| 1959 | -14.6      |
| 1960 | NA         |
| 1961 | -15.4      |
| 1962 | -12.4      |
| 1963 | -13.4      |
| 1964 | -16.1      |
| 1965 | -14.1      |
| 1966 | -14.2      |
| 1967 | -15.5      |
| 1968 | -13.3      |
| 1969 | -12.6      |
| 1970 | -13.6      |
| 1971 | -13.7      |
| 1972 | -15.3      |
| 1973 | -12.2      |
| 1974 | -16.6      |
| 1975 | -14.4      |
| 1976 | -13.6      |
| 1977 | -12.1      |
| 1978 | -14.0      |
| 1979 | -14.2      |
| 1980 | -14.0      |
| 1981 | -10.8      |
| 1982 | -14.7      |
| 1983 | -13.7      |
| 1984 | -14.3      |
| 1985 | -14.4      |
| 1986 | NA         |
| 1987 | -12.7      |
| 1988 | NA         |
| 1989 | NA         |
| 1990 | NA         |
| 1991 | -14.4      |
| 1992 | NA         |
| 1993 | NA         |
| 1994 | -13.5      |
| 1995 | -12.5      |
| 1996 | -13.5      |
| 1997 | -13.2      |
| 1998 | -8.8       |
| 1999 | -11.6      |
| 2000 | -13.7      |
| 2001 | -11.6      |
| 2002 | -13.0      |
| 2003 | -12.6      |
| 2004 | NA         |
| 2005 | -12.7      |

Sample of a completed graph



Source:

[http://data.giss.nasa.gov/cgi-bin/gistemp/gistemp\\_station.py?id=403710510000&data\\_set=1&num\\_neighbors=1](http://data.giss.nasa.gov/cgi-bin/gistemp/gistemp_station.py?id=403710510000&data_set=1&num_neighbors=1)