

Sea Ice Explorer



GOAL

Students use digital tools to explore the Historical Sea Ice Atlas and analyze changes in Arctic sea ice over time.



IN SHORT

Students explore maps, graphs and animations of the Historical Sea Ice Atlas to see how Arctic sea ice changes over time. They'll reflect on which visualizations make the most sense to them and why, then choose a location near Alaska and use the data to create their own sea ice graph.



ALASKA STANDARDS

Science (NGSS)

Disciplinary Core Ideas

ESS2.A: Earth materials and systems

ESS2.C: The roles of water in Earth's surface processes

ESS2.D: Weather and climate

Science and Engineering Practices

Analyzing and interpreting data

Obtaining, evaluating, and communicating information

Crosscutting Concepts

Patterns

Stability and change

Mathematics Standards

Math Content Standard Domain

4. Measurement and Data

Mathematical Practices

MP4: Model with mathematics

MP5: Use appropriate tools strategically



NARRATIVE FOR TEACHERS

In this lesson, we'll explore the Historical Sea Ice Atlas — an online tool that lets you see how Alaska's sea ice has changed since 1850. You'll try out different ways of visualizing the data, toggle through months and years to track changes over time, and zoom in on specific coastal communities to see what's happening locally.

Step 1 — Overview of tool

Begin by projecting the Historical Sea Ice Atlas and giving a brief overview of its interactive features before students explore independently.

Students may notice tools such as the date slider (1850–present), “past month” and “next month” buttons, a sea ice color scale, and a dropdown menu for selecting communities.

They will then use maps, graphs, a small multiples poster, and animations to examine the data and draw their own conclusions about how sea ice around Alaska has changed over time.

Step 2 — Small multiples

Below the map, students can download a small multiples poster showing October sea ice from 1850–2019. As a class, they examine the poster and discuss patterns, noting what each square shows, how the 170 images change over time, and what this reveals about Arctic sea ice. They can refer to the Historical Sea Ice Atlas website for more details on how the poster was created.

Step 3 – Explore a community

Have students click on a community name and observe what appears, including an image, coordinates, month selector, graphs, and downloadable data. Use this as an opportunity to briefly review latitude and longitude and how they help locate places on Earth.

Step 4 – Line graphs

Observe the line graph. Ask students what the y-axis shows (sea ice concentration), what the x-axis represents (years), and what the two lines indicate (May and September data). Then discuss what the graph reveals, such as overall decline and year-to-year variation.

Step 5 – Bar graphs

Observe the color bar graph. Ask students which colors represent open water and solid ice, and how the graph helps them quickly see changes over time.

Step 6 – Sea ice concentration animations

Watch the two sea ice animations (all months from 1850–2019 compared to the monthly averages). Ask students what they notice, what questions they have, how the data is displayed, and what changes near the end of the animation. Also discuss how the music shapes their response and whether this format effectively communicates the data.

Step 7 – Crunch the data!

Students choose a coastal community in the Historical Sea Ice Atlas and download its data to create a simplified graph. The graph should include:

- The community name and coordinates
- Y-axis (up and down) label (0–100% sea ice)
- X-axis (side to side) label (1850–2020 in intervals)
- Scroll through the data to find the dates (1850, 1870, 1890, etc.); plot and connect the points with two lines showing May and October data
- Students may also use the Kaktovik dataset below to create their graph

Discuss how students' graphs differ from the Sea Ice Atlas. Ask how more detailed, continuous data could improve their understanding of sea ice changes. Have students identify where the graph shows a consistent shift in sea ice concentration, then ask them to predict sea ice levels for October 2030.

Step 8 – Discuss

- Which data views did they enjoy most?
- Which were most effective for understanding the data?
- Which features were easiest to use?
- Where did the data come from? (Hint: check below the animations)

blah blah blah
blah blah

VOCAB WORDS

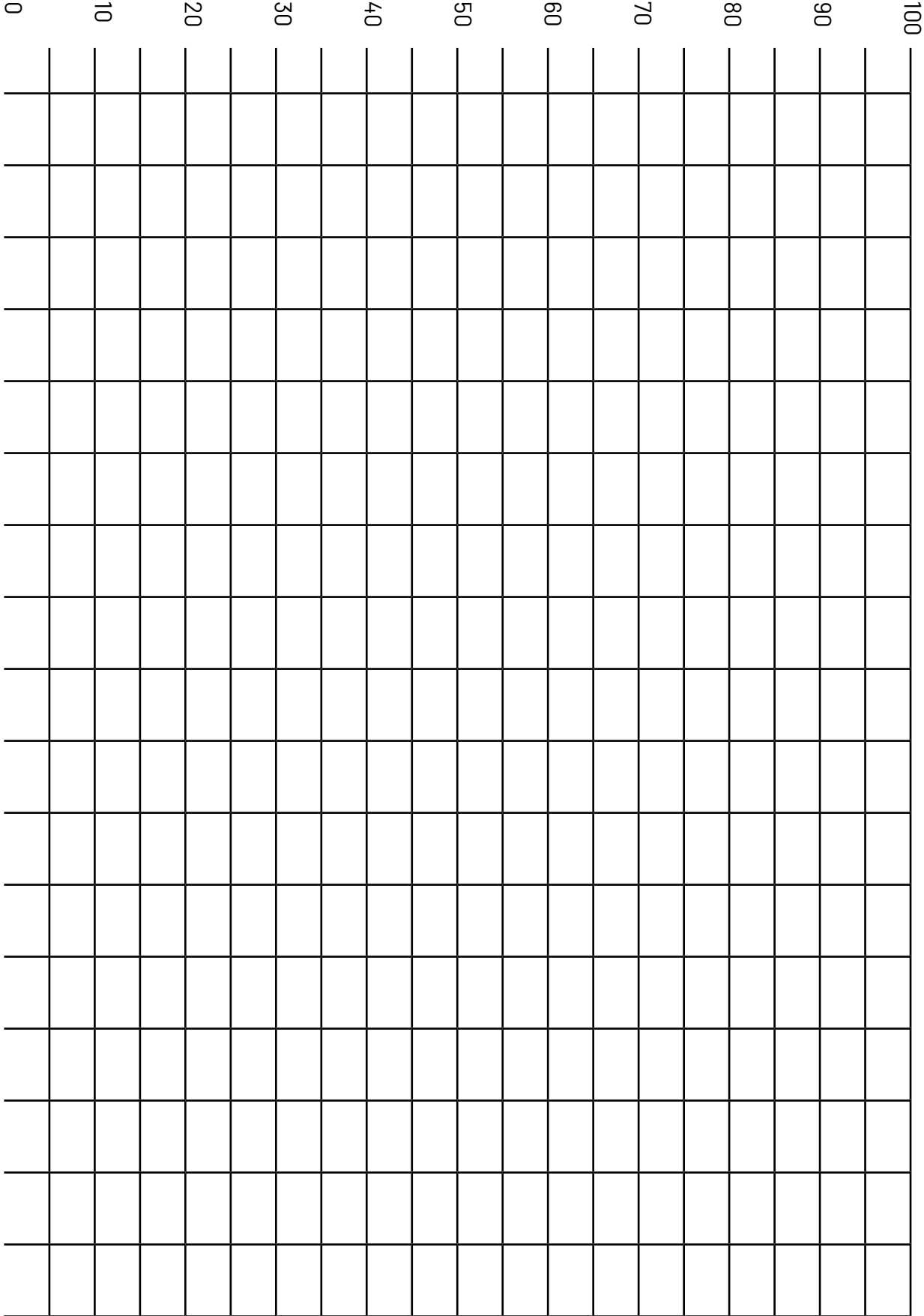
Latitude — Imaginary lines that divide the Earth running east to west, but measure your distance north or south.

Longitude — Imaginary lines that divide the Earth running north to south, but measure your distance east to west.

Sea ice concentration — Percentage of a specific ocean area covered by floating sea ice, typically measured in 10% to 100%.

Community name _____ Latitude _____ Longitude _____

y – axis



x – axis



SAMPLE DATA SOURCE

This is a sample dataset from Kaktovik, Alaska to be used for step 7 if students are unable to download data from the Historical Sea Ice Atlas online tool.

Year	May sea ice concentration (%)	September sea ice concentration (%)
1850	98	50
1860	98	74
1870	100	68
1880	100	100
1890	100	74
1900	100	50
1910	100	39
1920	100	0
1930	100	42
1940	100	100
1950	100	74
1960	95	54
1970	100	52
1980	100	57
1990	98	0
2000	98	0
2010	100	0
2020	93	0



HELPFUL TIPS

This lesson is part of a series of educational materials about sea ice in the Arctic using the Historical Sea Ice Atlas. Access the atlas at <https://seaiceatlas.org>. For a deeper dive on sea ice in the Arctic visit <https://nsidc.org/learn>.

Flip Book Scientist



GOAL

Students demonstrate their understanding of Arctic change by creating a flip book of sea ice concentration maps off Alaska.



IN SHORT

Data repeated through time can tell a story. In this lesson, students examine a series of maps of sea ice data from the same month over many years to explore patterns in sea ice over time.

Students create an animated version of this data by making a flipbook with 30 images from the past half century.



ALASKA STANDARDS

Science (NGSS)

Disciplinary Core Ideas

ESS2.A: Earth materials and systems

ESS2.C: The roles of water in Earth's surface processes

ESS2.D: Weather and climate

Science and Engineering Practices

Obtaining, evaluating, and communicating information

Crosscutting Concepts

Stability and change

Mathematics Standards

Math Content Standard Domain

4: Measurement and Data

Mathematical Practices

MP7: Look for and make use of structure



NARRATIVE FOR TEACHERS

Look over the poster (<https://seaiceatlas.org/Historical-Sea-Ice-Extents-October.pdf>) showing sea ice off Alaska 1850–2019 in October.

Step 1 – Discuss

Discuss the following with a partner:

- How is the information arranged in the grid?
- What dates are included on the poster?
- What do you notice about October sea ice extent during:
 - the 1800s?
 - the mid-1900s?
 - the early 2000s?
 - 2010–2019?
- How has sea ice extent changed over the past 50 years?

Step 2 – Cut out 30 sea ice images

Use the enlarged posters (1972–2019). Select 30 images total, including: 1972, 2019, 28 dates in between. Choose images that show noticeable differences in sea ice.

Carefully cut out each square, including the date. Arrange the images in order by date.

Step 3 – Glue images to notecards

This step requires precision for the book to flip smoothly. Place the notecards horizontally – wider than tall. Glue each sea ice image onto a card, lining the images up with the right side of the card.

Step 4 – Arrange flip book

Stack the cards in order, with 2019 on top. Cut out the Historical Sea Ice Atlas label and glue it to the center of the bottom card (this will be the cover).

Step 5 – Glue the book

Tap the stack on a table to align the edges. Apply glue along the left edge of the stack. Cover the glued edge with masking tape, wrapping slightly onto the front and back. Let it dry completely.

Step 6 – Try out the flip book and discuss

Hold the book in your left hand, with your fingers supporting the spine. Use your thumb to flip from back to front, should take about 2 seconds. After a few tries, the motion will become smoother. How does the sea ice change over time? Did viewing the flip book change how you understood sea ice data? Why or why not?

blah blah blah
blah blah

VOCAB WORD

Sea ice extent – The total area of ocean covered by at least 15% ice. Satellites are used to map the

boundary between open water and ice-covered ocean. It includes both solid ice floes and the open water between them, making it a reliable measure for tracking changes in sea ice over time.



MATERIALS NEEDED

- Glue stick
- 16 3 x 5 notecards per student (blue or white) pre-cut exactly in half
- Small Multiple Sea Ice poster (for reference) (<https://seaiceatlas.org/Historical-Sea-Ice-Extents-October.pdf>)
- Small Multiple Sea Ice poster enlargements # 1 AND #2
- Masking tape



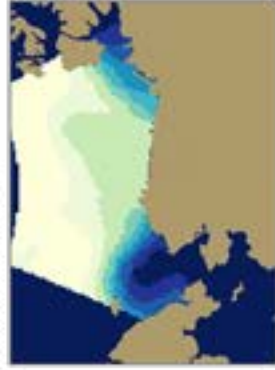
HELPFUL TIPS

This activity requires preparation by the teacher. Cut 3 x 5 notecards (16 per student) exactly in half so each student has a set of 32 cards with evenly aligned edges. Provide each student with copies of the two enlarged sea ice posters covering the years 1970–2019.

Students working in pairs can share a full copy of the Sea Ice off Alaska, 1850–2019 poster or view it on a laptop. For a whole-class discussion, project the “small multiples” sea ice poster after Step 1 onto a screen or whiteboard. Invite students to come up to the screen and make observations.

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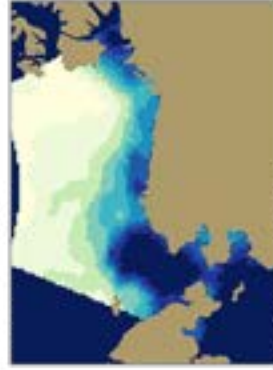
October 1970



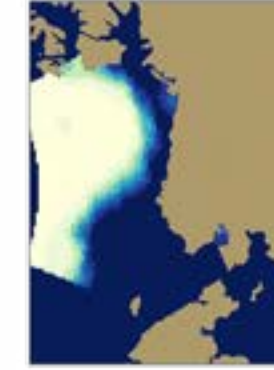
October 1980



October 1990



October 2000

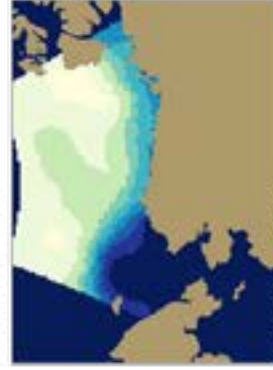


October 2010

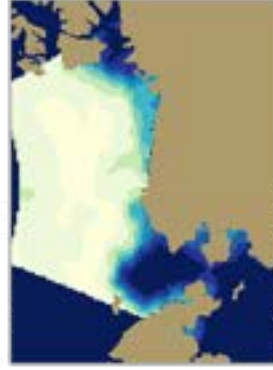
October 1971



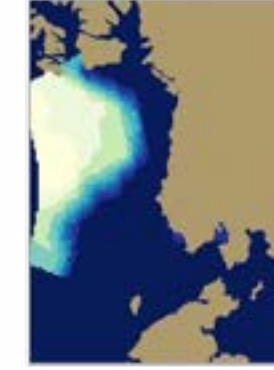
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October 1991



October 2001

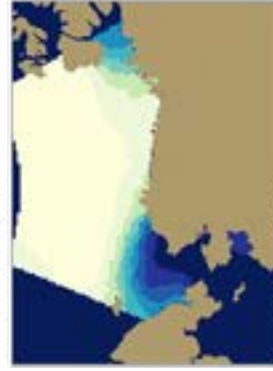


October 2011

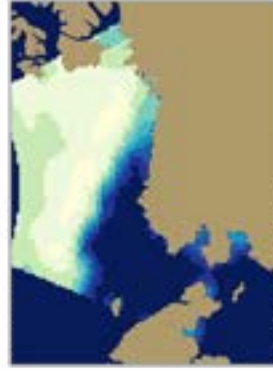
October 1972



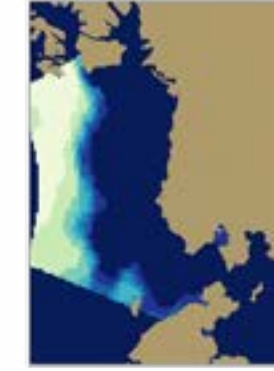
October 1982



October 1992



October 2002



October 2012

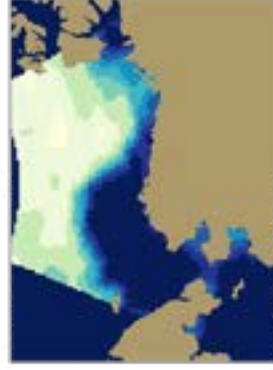
October 1973



October 1983



October 1993

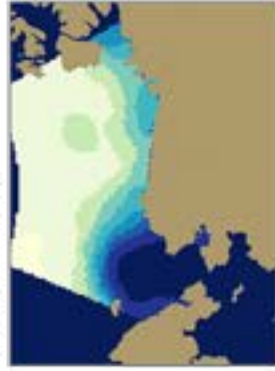


October 2003

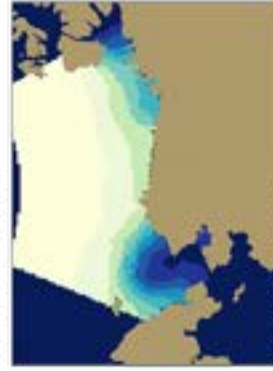


October 2013

October 1974



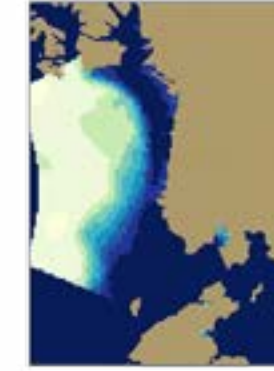
October 1984



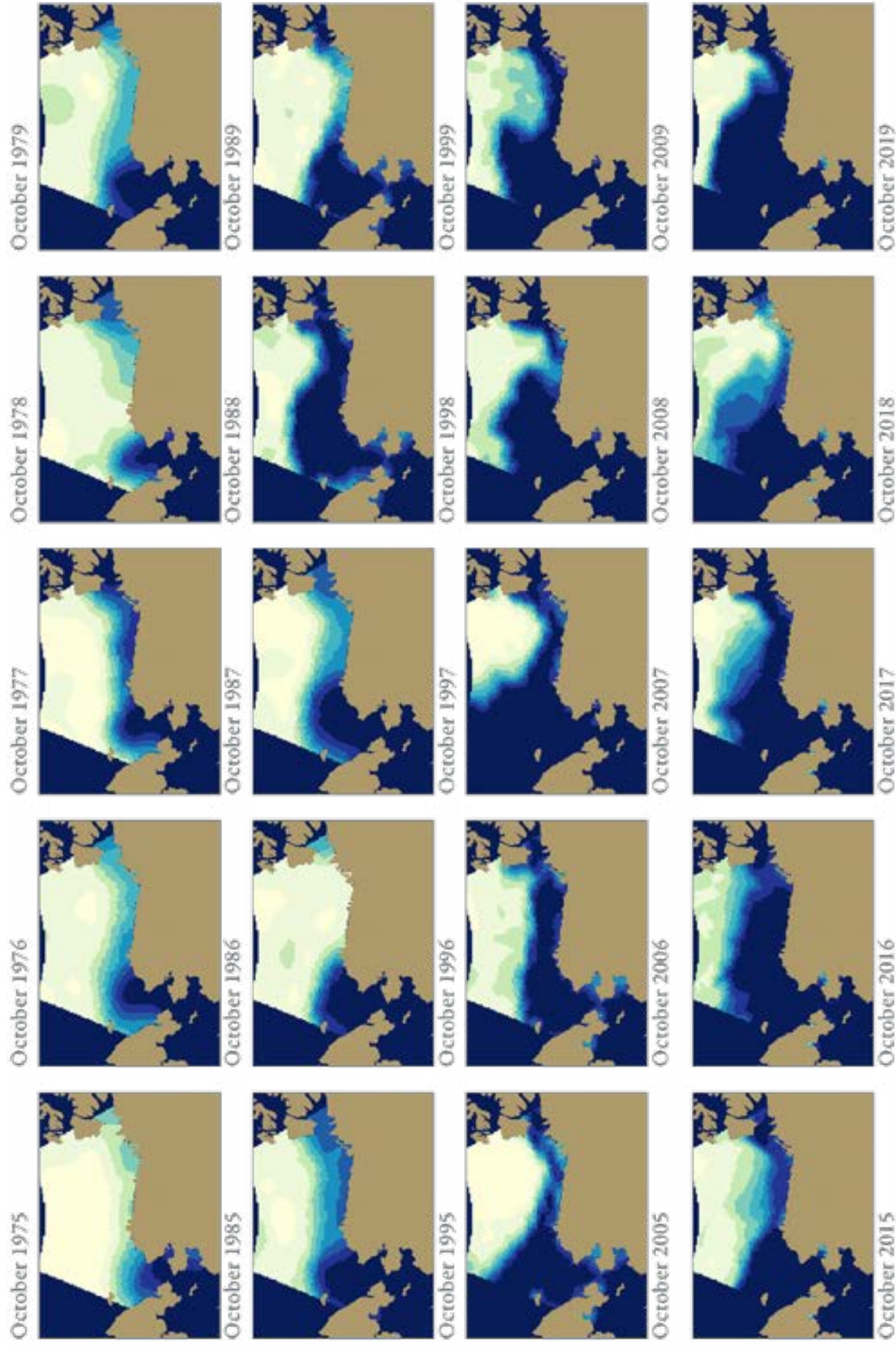
October 1994



October 2004



October 2014



Sea Ice Time Travel



GOAL

Students explore the history of sea ice concentrations in the Arctic and recreate a handwritten ship log from a specific location, month and year documented in the Historical Sea Ice Atlas.



IN SHORT

The Historical Sea Ice Atlas spans 1850 to current. Recent sea ice data comes from satellite imagery, while earlier records come from handwritten logs by explorers, seafarers, whalers, and hunters.

Students select a pre-1920 date, “travel” to a mapped location, and write a mariner’s report describing conditions using atlas data and their imagination.



ALASKA STANDARDS

Science (NGSS)

Disciplinary Core Ideas

ESS2.A: Earth materials and systems

ESS2.C: The roles of water in Earth’s surface processes

ESS2.D: Weather and climate

Science and Engineering Practices

Obtaining, evaluating, and communicating information

Crosscutting Concepts

Stability and change

English Language Arts

Writing 3: Use narrative writing to develop real or imagined experiences

Writing 4: Produce clear and coherent writing

Writing 8: Gather relevant information from multiple sources

Social Studies (Anchor Standard)

History 22: Historical sources and evidence

History 24: Historic thinking



NARRATIVE FOR TEACHERS

Step 1 – Watch a historic film

Explain that the Historical Sea Ice Atlas spans 1850 to today. Modern data comes from satellites, while earlier records were handwritten logs by explorers, sailors, whalers, and hunters. Show a short NOVA film about the *Endurance* (1914), a ship trapped and crushed by sea ice (alaskapublic.pbslearningmedia.org/resource/ess05.sci.ess.watcyc.seaice/antarctica-sea-ice/). Although set in Antarctica, it helps students visualize historic conditions and can inspire ideas for a mariner’s log.

Step 2 – Contents of a ship log

Have students brainstorm what a mariner’s log includes and list their ideas. Guide them to include:

- Date, ship and mariner’s names
- Weather and ocean conditions (wind, precipitation, swell)
- Navigation (latitude/longitude estimates, named landmarks, course, speed)
- Sea ice (thickness, floes, pack ice, noting when the ships were trapped (“beset”))
- Human activities (e.g., hunting, wildlife sightings, other ships, interactions with local people.)

Step 3 – Read handwritten whaling ship logs

Distribute sample logs from the *Mary and Helen* whaling ship. These handwritten entries include the date, weather, latitude and longitude, ice conditions (at times), and activities such as hunting, processing blubber, and resupplying.

Have students read selected entries with a partner, then discuss as a class what they learned. Next, provide transcriptions of additional logs to make the content easier to read. Ask students to identify key details and record their ideas on the board.

Step 4 – Changing Arctic

After the discussion, show a short film (<https://alaskapublic.pbslearningmedia.org/resource/ean08.sci.ess.earthsys.hunting/hunters-navigate-warming-arctic/>) on how changes in the Arctic are affecting Inuit communities.

Ask students: What might a hunter include in a log about Arctic conditions?

Step 4 – Time travel writing exercise

Using the Historical Sea Ice Atlas online tool (<https://seaiceatlas.org>), students travel back in time to a chosen location and date prior to 1920. Click on the map or choose a specific location to access information about sea ice at the chosen time and location.

Students write a mariner's or hunter's report describing the conditions at that time. Include the details identified in step 2. Time travelers are encouraged to use their imagination to create identities, ship names (if applicable), activities, and situations, bringing their reports to life while incorporating historical information.

blah blah blah
blah blah

VOCAB WORDS

Mariner — A sailor, often an old-fashioned term for someone who spends their life working at sea.

Latitude — Imaginary lines dividing the Earth east to west, but measure distance north or south.

Longitude — Imaginary lines dividing the Earth north to south, but measure distance east to west.

Sea ice floe — a flat piece of sea ice that floats on the ocean surface (~20 meters or more across).

Pack ice — large, dense mass of ice floes (covering >70% area) not attached to the shoreline.



HELPFUL TIPS

Students benefit from visual background information to better understand Arctic conditions for early mariners and hunters—a picture is worth a thousand words. Handwritten logs from the Mary and Helen provide additional insight into conditions in 1880. Students should watch both short films and review the logs to gather material for their “time-traveling” activity.

The transcribed logs omit narratives about hunting and processing whales and walrus, while the original handwritten excerpts include these details, such as cutting and boiling. Some students may find these descriptions distressing, but they may also be curious about why whaling was so extensive. Whale oil, derived from blubber, was a primary industrial lubricant during the Industrial Revolution and was also used as fuel for oil lamps.

This lesson is part of a series of educational materials about sea ice in the Arctic using the Historical Sea Ice Atlas. Access the atlas at <https://seaiceatlas.org>. For a deeper dive on sea ice in the Arctic visit <https://nsidc.org/learn>.



Transcriptions from the Steamer Mary and Helen 1879-80

Bounds towards the Arctic Ocean

Saturday Sept 27th, 1879

Commenced with fine weather and strong breezes from SW. Close hauled to westend and trying out Middle Part fine weather and fresh breezes from SW. steering E by S. Latter part the same Thus ends.

Lat 35.19N

Long 46-55W

Bound Towards the Arctic Ocean
Saturday Sept 27th 1879
Commenced with fine weather and strong
breezes from S.W. close hauled to the Westward
and trying out Middle Part fine weather
and fresh breezes from S.W. steering E by S.
Latter Part the same Thus ends
Lat 35.19N
Long 46-55W

Tuesday Nov 4th 1879

Commenced with fine weather and fresh trades steering SW by S under all sail watch employed in necessary work Middle Part fine weather and fresh trades steering SW by S under all sail passed several merchant ships Thus ends.

Lat 7-00. S

Long 30-43. W

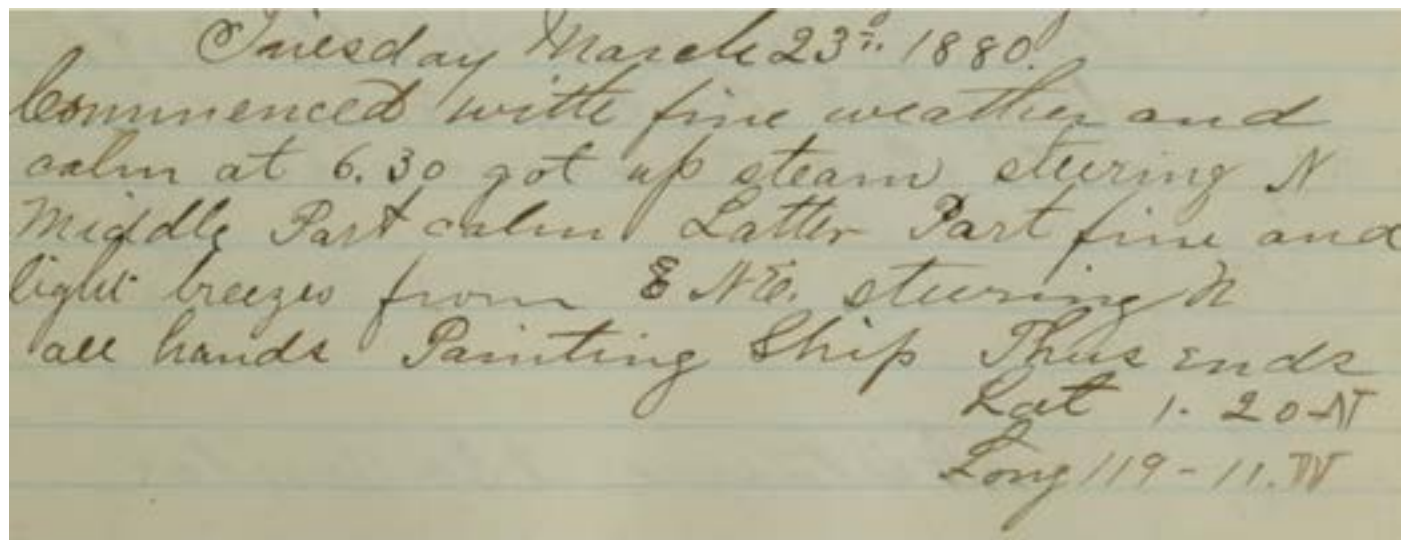
Steamer Mary & Helen MVB Millard Master
Tuesday Nov 4th 1879.
Commenced with fine weather &
fresh trades steering S.W. by S. under
all sail watch employed in necessary
work Middle Part fine weather and
fresh trades steering S.W. by S. under
all sail passed several merchant ships
Thus Ends
Lat 7-00.S
Long 30-43.W

Tuesday March 23, 1880

Commenced with fine weather and calm at 6.30 got up steam steering N Middle Part calm Latter Part fine and light breezes from NE steering N all hands painting ship Thus ends

Lat 1.20-N

Long 119-11.W



Tuesday March 23rd 1880.
Commenced with fine weather and
calm at 6.30 got up steam steering N
Middle Part calm Latter Part fine and
light breezes from E. N.E. steering N
all hands Painting Ship Thus ends
Lat 1.20-N
Long 119-11.W

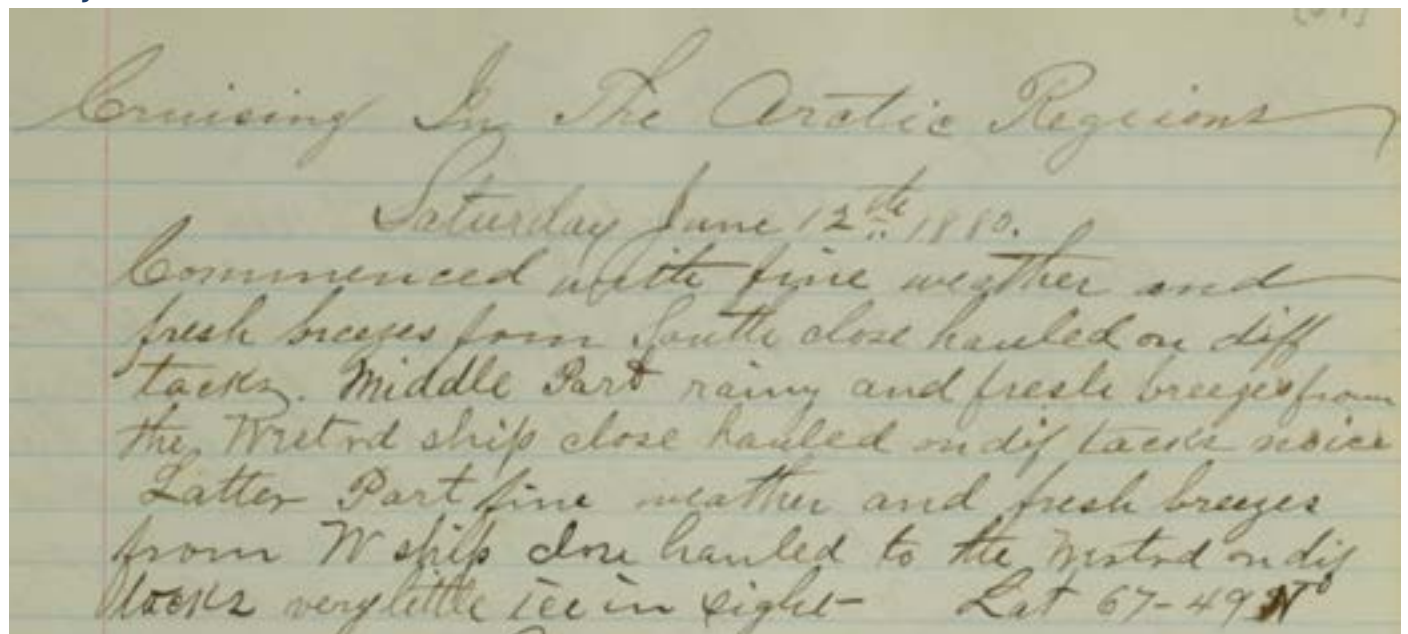
Cruising the Arctic Regions

Saturday June 12th 1880

Commenced with fine weather and fresh breezes from South Close hauled on diff tacks. Middle Part rainy and fresh breezes from the west and ship close hauled on diff tacks no ice Latter part fine weather and fresh breezes from W ship close hauled to the Westend on dif tacks very little ice in sight—

Lat 67-49N

Friday, June 18th, 1880



Cruising In The Arctic Regions
Saturday June 12th 1880.
Commenced with fine weather and
fresh breezes from South close hauled on diff
tacks. Middle Part rainy and fresh breezes from
the Westnd ship close hauled on dif tacks no ice
Latter Part fine weather and fresh breezes
from W ship close hauled to the Westnd on dif
tacks very little ice in sight- Lat 67-49N

Commenced with fine weather and light winds from N NW Ship working among ice looking for whales at 5 pm spoke BK Helen Mar and Rainbow. Middle Part fine weather and fresh breezes ship working among ice Latter Part whole sail breezes from N NW ship working up to Point Hope along the floe ice Rainbow in Co. Thus ends. No Lat and Long.

Wednesday June 20th, 1880

Friday June 18th 1880.
Commenced with fine weather and light winds from N. N. W. ship working among ice looking for whales at 5 P. M. spoke BK Helen Mar and Rainbow. Middle Part fine weather and fresh breezes ship working among ice Latter Part whole sail breezes from N. N. W. ship working up to Point Hope along the floe ice Rainbow in Co. Thus ends

Commenced with fine weather and fresh gale of wind from N employed in getting And ice mat ready spoke the schooner Alaska Banks Coral Helen Mar and Eliza Middle Part fine and more moderate employed in getting Provisions from Helen Mar Received on board the following 3226 lbs bread 12 bbls flour 5 bbls beef 5 Bbls pork And 1525 Bbls containers and to be returned at San Fransisco or paid at San Fransisco Prices And gave ancorder to that effect. Latter part fine weather and light winds from North Ship hauled towards Cape Lisburne Thus ends. (No Lat and long recorded but Cape Lisburne is 40 miles NE of the village of Point Hope

Wednesday June 20th 1880.
Commenced with fine weather and fresh gale of wind from N employed in getting an ice mat ready spoke the schooner Alaska Banks Coral Helen Mar and Eliza Middle Part fine and more moderate employed in getting Provisions from Helen Mar received on board the following 3226 lbs bread 12 bbls flour 5 bbls beef 5 Bbls Pork & 1525 Bbls containers and to be returned at San Francisco or Paid at San Francisco prices & gave an order to that effect. Latter Part fine weather and light winds from North ship close hauled towards Cape Lisburne Thus ends

Time traveler writing template

Time traveler’s name _____

Ship name (if applicable) _____

Date of log _____

Latitude _____ Longitude _____

Land marks (names of places) if near shore _____

Weather observations (temperature, wind) _____

Ocean conditions _____

Sea ice coverage and observations _____

Activities onboard _____

Time traveler sketches

A large, empty rectangular box with a thin dark border, occupying the majority of the page below the title. It is intended for the user to draw or sketch their time traveler concepts.

Cryosphere Word Cloud



GOAL

In this science based art and language lesson, students become familiar with science terms in the Historical Sea Ice Atlas by exploring the Cryosphere Glossary. They choose words to create a digital word cloud. Alternatively use the provided Inupiaq glossary of ice and snow terms.



IN SHORT

The cryosphere glossary in the Historical Sea Ice Atlas introduces students to key ice, snow, and research terms. Students create art in the form of a digital word cloud. Those who enjoy cartooning draw a character attached to the word bubble to speak “Cryosphere.”



ALASKA STANDARDS

Science (NGSS)

Disciplinary Core Ideas

ESS2.A: Earth materials and systems

Science and Engineering Practices

Obtaining, evaluating, and communicating information

Crosscutting Concepts

Systems and system models

English Language Arts

Language 4: Vocabulary acquisition and use

Alaska Arts Standards

1: Generate and conceptualize artistic ideas and work

Social Studies (Anchor Standards)

Geography 16: Human environment interaction: place, regions, and culture



NARRATIVE FOR TEACHERS

Step 1 – Discuss the cryosphere

Starting with laptops closed, ask students if they know the meaning of cryosphere and invite guesses. Break the word into parts: cryo (Greek for cold or ice) and sphere (globe). Explain that the cryosphere includes all of Earth’s frozen water, such as snow, river and lake ice, glaciers, sea ice, icebergs, permafrost, and the large ice sheets in Greenland and Antarctica.

Step 2 – Navigate to the Historical Sea Ice Atlas

Introduce the Historical Sea Ice Atlas (<https://seaiceatlas.org>) as a tool for viewing Arctic sea ice concentrations since 1850. Project the website and scroll to the “Learn more about sea ice” section. Point out the Cryosphere Glossary, located below the “Pick an Area of Interest” section. Have students navigate to the glossary on their laptops.

Step 3 – Select snow and ice words

Ask students to choose 15–20 snow- and ice-related terms from the Cryosphere Glossary. Give them 20–30 minutes to record the words and their definitions on a worksheet. Have students share at least three words and their meanings with a partner.

Step 4 – Make a word cloud

Have students go www.wordclouds.com. After choosing a shape, color theme, and font, enter their words to generate a word cloud. Save as a JPEG. (They may also create a word cloud by hand).

Step 5 – Collage

Students will use their word cloud to create an Arctic-themed collage. If they used a word bubble shape, they can design a character “speaking Cryosphere,” the scientific jargon.

On a small piece of paper (5 × 7), students should sketch a person or Arctic animal in pencil, outline it with marker, and add color. Then, using white and blue construction paper, they create an Arctic background. Finally, they cut out and arrange their character and word cloud onto the collage.

blah blah blah
blah blah

VOCAB WORD

Students access hundreds of snow and ice related words in the *Cryosphere Glossary* (<https://nsidc.org/learn/cryosphere-glossary>).

Alternately choose words from the Inupiaq Glossary of snow and ice related words (<https://upcolorado.com/university-of-alaska-press/apun-the-arctic-snow-teacher-s-guide>).



MATERIALS NEEDED

- Laptops
- Printer
- Copies of cryosphere glossary/ flashcard worksheets
- Copies of Inupiaq Glossary
- Construction paper – white, light blue, dark blue
- Colored pencils, fine tip marker
- Glue sticks, scissors

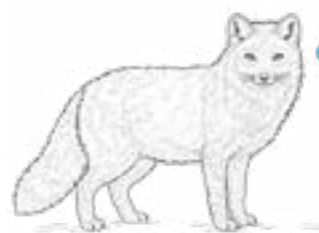


HELPFUL TIPS

For wildlife drawing tips, see the book William D. Berry: 1954–1956 Alaskan Field Sketches, or use a polar bear drawing tutorial at <https://artincontext.org/how-to-draw-a-polar-bear/>.

Streamline the activity by assigning specific definitions to students. Students can create flashcards for later use in a Cryosphere Glossary word share (templates provided). This science-based ELA lesson can support the study of language roots, science terminology, and Inupiaq vocabulary related to snow and ice. If laptops are not available, students may create a word cloud by hand.

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Cryosphere terms and definitions worksheet

Student name _____

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11.

12.

13.

14.

15.

16.

17.

18.

19.

20

Cryosphere terms and definitions flashcards

LESSON
PLAN
5–8 grade

Charting Arctic Communities



GOAL

Students explore the coordinate system of latitude and longitude, which allows them to describe the exact location of any place on Earth. They locate communities in Alaska and observe how sea ice concentrations have changed over time near these locations.



IN SHORT

The Historical Sea Ice Atlas relies on latitude and longitude to pinpoint locations around the Arctic. In this lesson, students map Arctic coastal communities in Alaska using coordinates, then examine sea ice concentration near three of them and how it has changed over time.



ALASKA STANDARDS

Science (NGSS)

Disciplinary Core Ideas

ESS2.A: Earth materials and systems

Science and Engineering Practices

Obtaining, evaluating, and communicating information

Crosscutting Concepts

Systems and system models

Mathematics Standards

Math Content Standard Domain

4: Measurement and Data

Mathematical Practices

MP4: Model with mathematics

MP5: Use appropriate tools strategically

English Language Arts

Writing.1: Write arguments to support claims with clear reasons and relevant evidence

Social Studies (Anchor Standard)

Geography 18: Geographic representations & reasoning

Geography 20: Geography of Alaska



NARRATIVE FOR TEACHERS

Step 1 – Observe the globe

Review the shape of the earth – a three-dimensional sphere with a north and south pole. Pass around globes, if available, and write student's observations on the board. Do they notice: continents, oceans, cities, mountain ranges, sea ice and ice sheets, deserts, lines running vertically between the poles (longitude), lines running horizontally (latitude).

Step 2 – Introduce latitude and longitude

Display a globe centered on the North Pole and introduce latitude and longitude (<https://www.usgs.gov/media/images/arctic-boundaries-arctic-research-policy-act-circumpolar-map>). Explain that latitude measures how far north or south a location is from the Equator, while longitude measures how far east or west a location is from the Prime Meridian, which passes through Greenwich, England. Together, latitude and longitude lines create a grid that allows us to pinpoint any location on Earth.

Latitude and longitude are expressed in degrees, minutes and seconds, although modern systems often use a decimal format. Latitude lines run east to west (0–90° N/S) and longitude lines run north to south (0–180° E/W). Can students locate Alaska and estimate its coordinates (about 60°N, 160°W).

Step 3 – Apply skills on a flat map

Project a flat map of Alaska (<https://store.usgs.gov/product/34465>) and point out the latitude and longitude lines. Demonstrate how to estimate coordinates by tracing from a point to the edges of the map. Ask students to find Nome and estimate its coordinates (about 64°N, 165°W).

Step 4 – Map Alaska communities

Introduce the Historical Sea Ice Atlas (<https://seaiceatlas.org/>) and explain that it uses latitude and longitude but does not show grid lines. Instead, it provides decimal coordinates. On their laptops have students click the “Choose a Community” tab on the atlas and locate the following places: Naknek, Emmonak, Kaktovik, Point Hope, Egegik, Golovin, Prudhoe Bay, Gambell, Kotzebue, and Diomedé.

On paper latitude/longitude maps of Alaska have students record each location’s coordinates, mark it on their map, and label it. Then, have them choose three additional communities to add.

Step 5 – Analyze sea ice change over time

Have students select three communities from their map. Return to the atlas and choose each community from the drop down menu. Scroll to the Sea Ice Concentration color chart, which shows monthly data from 1850 to present. Explain that the colors represent a range from open water (blue) to solid ice (yellow/beige). Ask students to describe patterns they see, how sea ice has changed over time, and whether there is more or less open water during certain times of the year. They should record their observations on the worksheet.

Step 6 – Class discussion

Bring the class together to make observations about sea ice change. Guide discussion toward recognizing year to year variability and identifying overall trends. Conclude by reinforcing vocabulary.

blah blah blah
blah blah

VOCAB WORD

Latitude – Imaginary lines that divide the Earth east to west, but measure distance north or south.

Longitude – Imaginary lines that divide the Earth north to south, but measure distance east to west.

Sea ice concentration – Percentage of a specific ocean area covered by floating sea ice, typically measured in 10% to 100%.

Equator – Imaginary horizontal line circling the Earth’s widest point, dividing the northern and southern hemispheres.

Prime Meridian – Imaginary vertical line from the North to South poles through Greenwich, England, dividing the eastern and western hemispheres.

Hemisphere – Literally “half-sphere.” The Earth is divided into four: northern, southern, eastern and western.



HELPFUL TIPS

Before the lesson print copies of the Alaska E map (<https://store.usgs.gov/product/34465>) for each student. If this is the first exploration of the Historical Sea Ice Atlas with students, preview the dropdown menu for selecting communities. Choose one and demo how the latitude and longitude is noted next to the community’s name. Scrolling down, there are two sea ice concentration charts, one with lines and one with colored bars.

This lesson is part of a series of educational materials about sea ice in the Arctic using the Historical Sea Ice Atlas. Access the atlas at <https://seaiceatlas.org>. For a deeper dive on sea ice in the Arctic visit <https://nsidc.org/learn>.

Alaska community sea ice investigation worksheet

Student name _____

Community #1 name and coordinates _____

What do you notice? Use these prompts to answer:

- Compare the sea ice concentrations over time from 1850 to the present.
- Is there more or less open water at certain times of the year?
- Compare and contrast sea ice between communities.

Community #2 name and coordinates _____

What do you notice? _____

Community #3 name and coordinates _____

What do you notice? _____
