
# Unit 4: Weather, Wind and Air

**Cause and effect: Everything is related in the natural world, locally and globally.**

## Lesson Plan 2 – Climate Change in the Chugach

**Summary**: In this lesson plan, students will learn about climate change - how it is caused and what the elders have to say about the impacts of climate change in the Chugach region. Students will also learn about global impacts of climate change and what can be done to slow it down.

**Grade Level**:
K-4, 5-8, 9-12

**Time required**:

Ten class periods of 45-60 minutes

**Materials needed***:*

- Maps of the local area, state, and world
- "Climate Change in the Chugach" booklet
- Science Journals
- Digital Camera/Recorder/scanner

**Learning objectives**:

- Students will investigate climate change and understand how it is caused.
- Students will summarize what the Chugach Elders have to say about impacts of climate change in the region.
- Students will demonstrate the impact climate change has elsewhere in the world.
- Students will brainstorm solutions to climate change and things they can do to make a difference.
- Students will understand the essential principles of Earth's climate system.
- Students will know how to assess scientifically credible information regarding climate.
- Students will discuss climate and climate change in a meaningful way.
- Students will make informed and responsible decisions with regard to actions that may affect climate.

**Vocabulary introduced:**

Climate Change, Global Change, atmosphere, stratosphere, troposphere, greenhouse effect, greenhouse gases, climate, weather, seasons, biodiversity

**National Science Education Standards:**

***Science in Personal and Social Perspectives***

Content Standard F: As a result of activities in grades K-4, all students should develop an understanding of

- Personal health
- Characteristics and changes in populations
- Types of resources
- Changes in environments
- Science and technology in local changes

Content Standard F: As a result of activities in grades 5-8, all students should develop understanding of

- Personal health
- Populations, resources, and environments
- Natural hazards
- Risks and benefits
- Science and technology in society

Content Standard F: As a result of activities in grades 9-12, all students should develop understanding of

- Personal and community health
- Population growth
- Natural Resources
- Environmental quality
- Natural and human-induced hazards
- Science and technology in local, national, and global challenges

**Alaska State Standards:**

***Cultural, Social, Personal Perspectives and Science***

A student should understand the dynamic relationships among scientific, cultural, social, and personal perspectives.

A student who meets the content standard should develop an understanding of

- The interrelationships among individuals, cultures, societies, and technology;
- That some individuals, cultures, and societies use other beliefs and methods in addition to scientific methods to describe and understand the world; and
- The importance of recording and validating cultural knowledge.

**Background Information:**

Become familiar with the local area noting changes that have taken place in the local environment within the past twenty to fifty years.

Meet the elders/cultural bearers prior to their visit to the classroom so they understand what you would like them to share and let them become familiar with the classroom.

Have water or tea for the elder/cultural bearer to drink during their visit to the classroom.

Review social expectations with the class prior to the guest speaker (sitting respectfully listening to stories, waiting until the speaker has finished talking before asking questions, offering assistance/escorting when the speaker is leaving).

Have a small gift of thanks for the guest (something made by the class, or a card, and follow with a letter from the students).

Please see the lesson plans on Chinook salmon and Pacific Walrus from the US Global Change Research Program's website and follow the procedures:

http://www.globalchange.gov/images/documents/toolkit/Western_Coastline/Activities/Western_Coastline_Activities_6_9_09.pdf

And

http://www.globalchange.gov/images/documents/toolkit/Polar_Subpolar/Activities/Polar_Subpolar_Activities_6_9_09.pdf

**Elders' Observations**

*"It has been weird weather here. We used to get a north wind a lot. It used to get rough out here."* (Carroll Kompkoff, Cordova, 2002)

*"I remember we used to get a north wind in Chenega."* (Mary Kompkoff, Chenega Bay, 2002)
*"The climate seems to be warming and with climate warming, water temperatures change."* (Nick Tanape, Elder, Nanwalek, 2010)

*"There were more urchins when I was a kid. The urchins were the first to go, then crab and clams. Bidarkis, they're the most recent change, now they're declining."* (Quote from Imam Cimiuca, 2010.)

*"My Uncle Wally used to predict summer. First day of spring, he'd say, "Well it looks like we're going to have pretty rainy weather this year." He's the one who taught me how to navigate. His navigation said don't go toward the swells, go toward the shine. He was right. He used to predict the weather and now what I think he's saying is something's wrong with the ozone and the line-up because our elders are confused now. If Uncle Willy were still alive, I suspect he'd say the same thing your people are saying. We go back to El Nino. We're not scientists but we know that our people used to be able to predict these things and can't now."* (Lydia Robart, Port Graham, 2002)

*"I haven't noticed any changes in the berries. In fact, we've noticed new places for berry picking."* (Barbara Olsen, Cordova, 2002)

*"Yeah, never seem to clear up, and stay clear. You know the weather isn't like it used to be years ago when she cleared up…you never had any power you know, all hand rowed and stuff…skiff, and used to go all around, and all around the place here…you know…around Prince William Sound. When the weather clear up, you have nice weather for a week, before she start get bad again. We always know when to come back. We sleep out, and you can't depend on the weather from day to day no more like that. Maybe sunshine is there, next morning it's raining and blowing."* (John Klashnikoff, 1979).

***<u>Resources: Alutiiq Words</u>***

***Climate and Weather Related Terms***

| | |
|---|---|
| Water | meq |
| Get water | mertarluni |
| Hot water | kulacaq |
| Rain water | kucitaq |
| River | kuik |
| Lake | nanwaq |
| Lagoon | nanwarnaq |
| Land | nuna |
| Fog (from ocean) | umek |
| Fog (from lakes, mountains) | taituk |
| It's foggy | umgaa |
| Moisture | mecuq |
| Ice | cikuq |

| | |
|---|---|
| Melt | uruglluni |
| Rain | qiteq |
| It is raining | qiterluni |
| Sky | qilak |
| Snow (falling) | qaniq |
| Snow (on the ground) | aniuq |
| It is snowing | qanirluni |
| Cloud | amirluq |
| Cloudy, be cloudy | taluluku |

(From *Nanwalegmiut Paluwigmiut-llu Nupugnerit – Conversational Alutiiq Dictionary, Kenai Peninsula Alutiiq* by Jeff Leer, 1978)

**Resources: Literature, audio, video, other curriculum**

***Literature***

- Please see the lesson plans on Chinook salmon and Pacific Walrus from the US Global Change Research Program's website and follow the procedures:
- https://www.globalchange.gov/about/highlights/2017-protecting-fish-wildlife-plants-and-ecosystems-changing-climate
- https://www.wildlifeadaptationstrategy.gov/pdf/Marine_Ecosystems_Paper.pdf

- Benoit, Peter. *Climate Change (True Books: Ecosystems). 2011. Children's Press.*
- Collier, Michael. *The Melting Edge – Alaska at the Frontier of Climate Change.* Alaska Geographic.
- Cole, Joanna and Bruce Degen. *The Magic School Bus and The Climate Challenge.* 2010. Scholastic Inc. New York.
- Lethcoe, Jim. *The Weather and Climate of Prince William Sound.* 2003. Prince William Sound Books.
- McCutcheon, Chuck. *What are Global Warming and Climate Change? Answers for Young Readers - Worlds of Wonder.* 2010. University of New Mexico Press.
- Woodward, John. *Climate Change (DK Eyewitness Books)*. 2008. DK Publishing.

***Video***

- Alaska Native Perspectives on Earth and Climate on Teacher's Domain: https://www.pbslearningmedia.org/collection/ean/#.WkZ_i0xFw0Q
- PBS/Hippo Works: http://www.hippoworks.com/hippoHOME.html
- US Global Change Research Program. *Impact of a Changing Climate on the Pacific Walrus lesson plans, grades 5-8:* http://www.globalchange.gov/images/documents/toolkit/Polar_Subpolar/Activities/Polar_Subpolar_Activities_6_9_09.pdf
- US Global Change Research Program. *Impact of Climate Change on Chinook Salmon lesson plan, grades 5-8:* http://www.globalchange.gov/images/documents/toolkit/Western_Coastline/Activities

/Western_Coastline_Activities_6_9_09.pdf

***Other curriculum***

- Alaska Department of Fish and Game. *Wildlife Curriculum – Alaska Wildlife for the Future: Section 3. "When Populations Decline – Losing Biodiversity".* 2001.
- Alaska Department of Fish and Game. *Alaska Wildlife Curriculum – Alaska Wetlands and Wildlife: Section 3. "Wetlands in a Changing World - Climate Change and Wetlands".* 2007.
- Alaska Sea Grant. *Alaska Seas and Rivers Curriculum: Our Changing World:* http://seagrant.uaf.edu/marine-ed/curriculum/grade-8.html

***Climate Change lesson plans***

- https://www.wildlifeadaptationstrategy.gov/strategy.php
- The Atmospheric Radiation Measurement (ARM) Climate Research Facility Education and Outreach Program: basic science lessons related to weather and climate for K-12th grade. https://www.slideserve.com/elana/arm-atmospheric-radiation-measurement-program-the-united-states-department-of-energy & www.angelo.edu/services/library/govdocs/lesson.php
- ARM lesson plan and info about Climate Change in Alaska: http://education.arm.gov/teacherslounge/lessons/climate_change.pdf?id=75Alaska
- PBS: Climate Change Lesson plan for grades 9-12 http://www.pbs.org/now/classroom/globalwarming.html
- Smithsonian Institute/Prehistoric Climate Change and Why it Matters Today: lesson plan for grades 4-8, 9-12. http://www.smithsonianeducation.org/educators/lesson_plans/climate_change/index.html
- NASA/Education http://climate.nasa.gov/education/
- Alaska K-12 Science Curricular Initiative lesson plan database (searchable): http://aksci.org/lessons_database/search_results.php
- Impact of a Changing Climate on the Pacific Walrus lesson plans, grades 5-8: http://www.globalchange.gov/images/documents/toolkit/Polar_Subpolar/Activities/Polar_Subpolar_Activities_6_9_09.pdf
- Impact of Climate Change on Chinook Salmon lesson plan, grades 5-8: http://www.globalchange.gov/images/documents/toolkit/Western_Coastline/Activities/Western_Coastline_Activities_6_9_09.pdf

***Other web resources on Climate Change for educators and schools***

- http://oceanexplorer.noaa.gov/edu/lessonplans/lessonplans.html
- https://19january2017snapshot.epa.gov/climate-impacts/climate-impacts-alaska_.html
- https://nca2014.globalchange.gov/report/sectors/indigenous-peoples
- Kachemak Bay Research Reserve (ADFG) / Presentations on Local Impacts of Climate Change http://trnerr.org/wp-content/uploads/2016/04/Climate-science_Kachemak-

Bay_Kenai-Peninsula.pdf
http://accs.uaa.alaska.edu/kbnerr/climate-resilience/
http://accs.uaa.alaska.edu/files/kachemak-bay/NSC-Factsheet.pdf

- NOAA illustrations on Climate, climate change and greenhouse effect
  http://oceanexplorer.noaa.gov/edu/lessonplans/lessonplans.html
  http://oar.noaa.gov/k12/html/greenhouse2.html
- Alaska Seas and Rivers Curriculum: Alaska Glacier Photos.
  http://seagrant.uaf.edu/marine-ed/curriculum/images/stories/grade8/alaska_glaciers_sm.pdf
- U.S. Global Change Research Program: Climate Change Wildlife and Wildlands.
  https://www.globalchange.gov/browse/educators/wildlife-wildlands-toolkit/video
- https://www.globalchange.gov/browse/educators/wildlife-wildlands-toolkit
- Puget Sound Clean Air Agency: Cool School Challenge
  https://www.nwf.org/~/media/PDFs/Eco-schools/Cool-School-Challenge/7-31-14-ES_CSC-Implementation-Guide_Final.ashx
- State of Alaska: http://www.climatechange.alaska.gov/
- US Environmental Protection Agency:
  https://nca2014.globalchange.gov/report/regions/alaska
  https://www.epa.gov/sites/production/files/2016-07/documents/alaska_fact_sheet.pdf
- US Environmental Protection Agency, Global Warming Wheel card classroom activity:
  https://19january2017snapshot.epa.gov/climatechange/global-warming-wheel-card_.html
  https://19january2017snapshot.epa.gov/sites/production/files/2016-07/documents/wheel_welcome.pdf
- NOAA: http://www.noaa.gov/climate.html
- AOOS: http://www.aoos.org/
- Pew Foundation: www.pewinternet.org/2016/10/04/the-politics-of-climate/
  http://www.pewglobal.org/2015/11/05/1-concern-about-climate-change-and-its-consequences/
- Alaska Native Tribal Health Consortium: https://anthc.org/what-we-do/community-environment-and-health/center-for-climate-and-health/
- https://anthc.org/what-we-do/community-environment-and-health/climate-change-food-security/
- COSEE Alaska: http://www.coseealaska.net/
- Alaska Sea Grant: http://seagrant.uaf.edu/map/climate/index.php
- Recycling in Alaska, Total Reclaim Alaska: www.totalreclaim.com
- Tribal Climate Change: http://www4.nau.edu/tribalclimatechange/
- Alaska Natural Heritage Program: http://aknhp.uaa.alaska.edu/
- University of the Arctic: https://www.uarctic.org/organization/thematic-networks/
- Network with the class and report your environmental observations at:
  https://anthc.org/what-we-do/community-environment-and-health/leo-network/

***SmartBoard***

- Energy Sources. Identify different sources of energy. Classify energy sources. (6) http://exchange.smarttech.com/details.html?id=2e966238-b885-4242-9aea-4e3f5397e10d
- Renewable and Nonrenewable Sources. This smart board lessons covers renewable and nonrenewable resources on earth. Links and video clips are attached to each slide. The lesson opens with a matching game. There is a chocolate mining activity to show the relation between mining and hurting the environment. (5) http://exchange.smarttech.com/details.html?id=b6636c7a-58af-4776-ae47-caa49207d8ae

**Procedure*:***

***Engagement***

- Show a video of climate change activity and discuss it. (http://www.teachersdomain.org/resource/ean08.sci.life.eco.unpredictability/)
- Share the local stories of changes in the area, compare and contrast what was observed in the video to what could been seen in the area today.
- Discuss the changes local people have observed and the possible causes of these changes.
- Have students fill out a KWL chart on what they know about climate change. Refer back to this chart daily to update what they are learning.

***Exploration***

- Take students on a field trip to observe where changes have occurred. Have them observe the area noting the environmental factors that may have played a role in the changes, direct them to record in their science journals and with photographs. There may be more than one site to visit so other field trips will have to be set up accordingly.
- Direct students (working in pairs) to do an Internet search on climate change, taking notes and keeping track of the sites they visit. This research may take more than one class period based on the skills of the class.
- Discuss the search results with the class, noting how the changes are similar or different from the local area.

***Explanation***

- Have students share important observations and facts regarding climate change in small groups with a reporter selected from each group to report to the whole class their findings.
- Introduce the vocabulary and discuss the definitions. Include the indigenous words in this section.
- Invite the oldest Elder from the community, and another who is about 20 years younger, then have them explain about the changes they have observed from when they were children focusing on the climate of the area, including landforms, vegetation, insects, and when they hunted or when animals move around.

- Have students record the visitors, taking notes or using a digital camera/video.
- Follow the guest Elders' time with a discussion on the changes that have occurred, and point out what may be happening in the state, the nation, then internationally with climate change.
- Direct students to do research on global effects of climate change. Share the information in class discussion.
- Brainstorm causes of climate change along with suggested preventative measures that could be taken on an individual level and community level.

***Elaboration***

- Direct students to brainstorm a list of family members they could interview about the effects of climate change in the region.
- Brainstorm a list of pertinent questions that could be asked to get the most information possible from the interviews.
- Discuss the appropriate way to conduct an interview prior to having students conduct their interviews.
- Assign students a presentation of their interview findings in either: poster format, movie, PowerPoint, or a report to the class.
- Students will then write a report, which will compare and contrast the climate changes of their Alaskan home region to another place in the world (no repetitions).

***Evaluation***

- Observe students as they participate in classroom discussions for engagement and understanding of the topic.
- Analyze student science journals for comprehension of the lesson and theme.
- Student use of vocabulary.
- Student created presentation and written report on climate change.

**Follow up activities:**

- Join the Alaska Native Health Consortium's Local Environmental Observer (LEO) Network with the class and report your environmental observations at: http://www.anthc.org/chs/ces/climate/leo/

  "The LEOs are the eyes, ears and voice of environmental change in Alaska communities."

- Direct students to gather photographs from members of the community to scan and then send them out to photograph the same area to compare and contrast how things have changed, including titles and post in the hallways. Do as many as possible and invite the community to view the wall presentation.