



Adapting to Survive

Grades 3-5

Lesson Summary

Students will learn about the different climatic regions in Alaska and about the relationship between the physical characteristics of the land and the ways in which people adapted in the area. Students will also learn about the importance of traditional knowledge.

Prior Knowledge & Skills

- Responsible internet search skills
- Knowledge about climate zones

AAAS Science Benchmarks

The Nature of Technology

Technology and Science

Human Society (with extension)

Cultural Effects on Behavior

NSES Science Standards

Life Science

Structure and Function in Living Systems

Regulation and Behavior

NCGE Geography Standards

The World in Spatial Terms

Standard 1

Places and Regions

Standard 5

Environment and Society

Standard 15

Teaching Time: 45 – 60 minutes

Materials

- Map of Alaska
- Use of computers with access to the internet
- Books, magazines, textbooks with information on the different regions of Alaska and on Native Alaskan peoples that are from each region

Advanced Planning

Preparation Time: ~10 minutes

1. Review the instructions
2. Gather the necessary supplies.

Recommended Reading: (for teachers)

- Background Information: Impacts of Climate Change in the Arctic

The Atmospheric Radiation Measurement Program – North Slope, Alaska
Bringing Climate Change Into The Classroom

<http://www.arm.gov/>

Bringing Climate Into The Classroom

Key Ideas

Students will:

- Understand that people are adaptable.
- Consider the potential effects of climate change in the Arctic.



Background Information: Impacts of Climate Change in the Arctic

The Arctic is one of the planet's most extreme environments. It has extreme temperatures, limited sunlight and precipitation, and a short growing season. The ecosystems in the Arctic are all quite sensitive to change. Sea ice, snow cover, glaciers, tundra, permafrost, boreal forests, and peatlands all respond to small changes in sunlight, surface temperature, ocean heat transport, air and ocean chemistry, and pollution in the atmosphere.

The ARM Program does climate change research in the Arctic in order to help make global climate models more accurate. These models currently show that climate change in polar regions will most likely result in changes in the extent of sea ice, increased thawing of permafrost, and melting of polar ice masses, which will cause societal impacts around the globe.



Changing Weather and Climate

Alaska is vulnerable to climate change, and Alaska's climate is expected to change as global temperatures rise. Climate trends over the last three decades have shown considerable warming. This has already led to major impacts on the environment and the economy. Subsistence livelihoods in the Inupiat communities on the North Slope depend on fish, marine mammals and other wildlife, and play a very important social and cultural role. Arctic residents and scientists report many changes in recent decades such as a decrease in the predictability of weather, increases in lightning and thunder, changes in wind, storms, and other weather variables. The changes in the weather and climate are beginning to impact Arctic ecosystems, and these large-scale changes are bound to greatly affect communities on the North Slope.

Changing Ecosystem

Arctic ecosystems are known to have complex interrelationships between species and their physical environment. As a result, climate-induced changes that affect one part of a species life cycle can have wide-reaching effects on the ecosystem as a whole. First, a warming climate will cause a shift toward the pole of ecosystems and their associated animals. For example, the current northern treeline, shrubs, and associated plants will move north over the tundra. This will have major impacts on biological resources. Warming also causes considerable thawing of permafrost. This will lead to changes in drainage, increased bank slumping, and altered landscapes over large areas. All of these effects will disrupt current vegetation, ecosystems, water balance, and human structures. Warming might increase biological production in the Arctic ecosystem, but this may lead to different species composition on the land and in the sea. In the sea, marine ecosystems will move poleward, and animals dependent on ice may be disadvantaged. The melting sea ice will cause changes in salinity in the Arctic Ocean which will have an impact on marine life and on water circulation. Human communities in the Arctic will be affected by these physical and ecological changes. The effects will be particularly important for indigenous peoples leading traditional lifestyles.

Sea Ice

Sea ice covers a vast area in the Arctic Ocean, about 7.5 to 15.0 million kilometers. This permanent ice pack covers the North Pole and is always moving and decreasing and increasing in area throughout the year. This cover of sea ice over the ocean greatly effects the interaction of energy exchange between the ocean and the atmosphere, absorption and reflection of sunlight, and the ability to support marine life within the Arctic Ocean. Sea ice plays a major role in global heat balance. Higher temperatures in our atmosphere may cause the area of ocean covered by sea ice to reduce. In the summer, this would allow increased absorption of solar radiation, or sunlight, at the ocean surface. This will cause a further increase in atmosphere and ocean temperatures, which will then further reduce ice cover. This is known as the “sea ice albedo temperature positive feedback loop.” In the winter, leads and cracks in the sea ice allow heat flow from the relatively warm water to the much colder atmosphere, which also causes a warming of the atmosphere. Since the early 1970’s satellites have observed a steady decline in the Arctic sea ice cover, and scientists are studying whether global warming is the force that is driving this reduction in sea ice. So, as you can see, small changes in sea ice can cause big changes in the polar climate, which affects the global climate!



Sea ice off the Barrow coast.

Activity 4: Adapting to Survive

This lesson is an introduction to Native Alaskans of the past. In order to survive, humans have always had the same basic physical needs such as food, shelter, and companionship. The physical characteristics of the land determine in large part how we satisfy those needs, and as the Earth changes we must adapt to survive.



Objective:

The objects of this lesson are:

1. To increase the student's knowledge of climate differences in the different regions of Alaska.
2. To increase the student's awareness of the relationship between the physical characteristics of the land and the ways in which people adapted in that area.
3. To increase the student's awareness of the importance of traditional knowledge.

Materials:

Map of Alaska

Use of computers with access to the Internet

Books, magazines, textbooks with information on the different regions of Alaska and on Native Alaskan peoples that are from each region.

Introduction:

Climate plays an important role in determining the physical characteristics, ecosystem, and vegetation of a region. People everywhere have to adapt to the physical environment around them in order to survive. This was especially true in the past, before all of the modern conveniences we have today. Think about the skills needed by Native Alaskan people in the past when basic needs such as food, clothing, and shelter were determined by what people found in the natural world around them.

Lesson 1: Climate

Looking at a large map of Alaska, point out the 5 different regions in Alaska, the Southeast, the Aleutian Chain, the Interior, the North Slope, and the Western region of Alaska. Discuss differences in climate, weather, and environment in these regions. Discuss with the class how climate can affect the environment. Have the students tell you what they know about each region.



Suggested Websites:

<http://climate.gi.alaska.edu/change/regions.html>

<http://tqjunior.thinkquest.org/3878/>

<http://www.wrcc.dri.edu/narratives/ALASKA.htm>

Suggested Readings:

The Great Alaska Nature Factbook. Alaskas Geographic Regions, pages 9-15
Alaska Almanac, Regions of Alaska

Teachers: between these 5 regions? regions in Alaska. What are the ecosystems in these 5 regions like? What are the differences? Have them first find out what climate is, and then research and discuss how it affects the different regions. Have the students do research using either textbooks or the Internet.

Have your students:

1. Write a paragraph on climate. What is climate? What are some basic facts about climate vs. weather?
2. Write either a short paper or give a presentation to the class on the differences in climate in the 5 Alaskan regions (Teachers, as an alternative you can break the class into 5 groups and have students from each group research one of the 5.)

Lesson 2: Traditional Knowledge

How did people who lived in these regions in the past adapt to survive? Every society in the world has evolved useful and fitting adaptations to the surrounding environment. Adaptions are how cultures are created. Discuss ways in which Native Alaskan people took objects they found in the natural world and made things that were necessary for survival such as tools, home building materials, and clothing. Discuss some of the differences of living and surviving that Native Alaskan people used in each of these 5 regions.



Other Related Classroom Activities:

1. Have students write a paragraph about how they would use their natural surroundings to survive. What did people eat? What would they use for shelter? Clothes?
2. Invite an elder from your community into the classroom to talk about some of the traditional knowledge useful for survival in the area.



**To find out more about climate change,
visit these web sites:**

- Atmospheric Radiation Measurement (ARM) Project: www.arm.gov
- EPA Global Warming site: <http://www.epa.gov/globalwarming/>
- Institute of Global Environment and Society: <http://grads.iges.org/>
- NSF Polar Reserch: <http://www.nsf.gov/home/polar/start.html>

**For climate change teaching resources,
visit these websites:**

- ARM Education Program's Education Center: www.arm.gov/docs/education
- ARM Education Lessons: <http://www.arm.gov/docs/education/tlessons.html>
- Oklahoma Climatological Survey Weather Series Lessons:
<http://k12.ocs.ou.edu/teachers/lessons/default.html>
- Atmospheric Visualization Collection lessons:
http://avc.comm.nsdlib.org/cgi-bin/wiki.pl?Atmospheric_Visualization_Collection

References:

Atmospheric Radiation Program: <http://www.arm.gov>

National Science Foundation: <http://www.nsf.gov/od/lpa/news/publicat/nsf0050/arctic/seaice.htm>

Center for Global Change and Arctic System Research: <http://www.cgc.uaf.edu/>

Arctic Climate System Study: <http://acsys.npolar.no/impplan/sea%20ice.htm>

National Snow and Ice Data Center: http://nsidc.org/sotc/sea_ice.html