

HOW DO LIVING THINGS OF THE PAST COMPARE WITH THOSE OF TODAY?

**UNIT 7: Your
Environment**
Lesson 18 — Grades 4-5
INSTRUCTIONS



Overview

In this lesson, students will imagine what their area looked like long ago, and learn about the fossilization process through a simulation game.

Objectives

On successful completion of this lesson, students will be able to:

- Describe one method by which a fossil is formed; and
- Give one example of an animal that used to live in Alaska that is now extinct.

Alaska Standards

Alaska Science Standards / Grade Level Expectations

- [4, 5] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring and communicating.
- [4, 5] SA3.1 The student demonstrates an understanding that interactions with the environment provide an opportunity for understanding scientific concepts by identifying the local limiting factors (e.g., weather, human influence, species interactions) that determine which plants and/or animals survive.
- [4] SA1.2 The student demonstrates an understanding of the processes of science by observing, measuring, and collecting data from explorations and using this information to classify, predict and communicate.
- [4] SC1.2 The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by describing fossil evidence (e.g., casts, track ways, imprints, etc.) of extinct organisms. [5] SA1.2 The student demonstrates an understanding of the processes of science by using quantitative and qualitative observations to create inferences and predictions.
- [5] SC1.2 The student demonstrates an understanding of how science explains changes in life forms over time, including genetics, heredity, the process of natural selection, and biological evolution by making reasonable inferences about fossil organisms based on physical evidence.

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Alaska Cultural Standards

[E] Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. Students who meet this cultural standard are able to:

[E1] recognize and build upon the interrelationships that exist among the spiritual, natural, and human realms in the world around them, as reflected in their own cultural traditions and beliefs as well as those of others.

[E2] understand the ecology and geography of the bioregion they inhabit.

Bering Strait School District Scope & Sequence

4th grade sequence #4: Living Things (Animals)

E. Describe fossil evidence of extinct organisms.

5th grade sequence #5: Living Things (Animals)

Materials

- Fossil Samples (“Methods of Fossilization Collection” from Acorn Naturalists recommended)
- Animal Cards for game (one set of 30)
- Event Cards for game (one set of 30)
- Poster: Ice Age Mammals of the Alaskan Tundra.

Multimedia

REACH Multimedia 4-6: “How do Animals and Plants Adapt?”

REACH Multimedia 4-6: “Shelter Game”

Available at: www.k12reach.org

Additional Resources

HSP IV: Ch. 3, Lessons 3

Activity Preparations

1. Read through the entire lesson, including the background information in the Whole Picture section.
2. If replacement cards are needed, use the template in the appendix to make a new set.



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Whole Picture

Alaska Native oral history and place names shed light on the geologic history of Alaska and the way things used to be. St. Lawrence Island, for example, is called “Sivuqaq” by the local people, which translates as: “to squeeze the water out of cloth or something.” Oral tradition holds that the island was formed when the land was picked up from the sea and the water was squeezed out, “it is shaped to fit the palm of a hand” (Noongwook, 2002, p.99). Geologically, this makes sense, as St. Lawrence Island is a piece of the land bridge that existed between Alaska and Asia during the Cenozoic period (65.5 million years ago (Mya)).

Throughout time, Alaska has seen a dramatic change in its flora and fauna. Between years 4,600-251 mya, during the Precambrian and Paleozoic eras, much of Alaska was covered by a shallow sea, and local fauna consisted of ammonites, brachiopods, and corals. As the waters deepened in northern Alaska bony fish and ichthyosaurs began to appear. By the end of the Cretaceous period, 145.5-65.5 mya, the landscape had become more terrestrial; dinosaurs roamed the landscape munching on small shrubs and grasses in addition to conifers, elms, and oaks. By the early Cenozoic period (65.5 mya), the land bridge connected Alaska with Asia; the dinosaurs were gone, the flora was similar to the plants we might find in tropical and subtropical regions today, and early humans, mammoths, and other megafauna roamed the area. It was not until the end of this period, during the Pleistocene (2.588 mya to 11,700 years ago), that the landscape and flora we are familiar with today emerged, though megafauna like mammoths, giant short-faced bears, and steppe bison continued to roam the land until about 10,000 years ago (NPS, n.d., “Survivors;” UCMP, 2006).

The paleontological record indicates that twelve types of dinosaurs are known to have lived in the Alaska region. These include four families each of meat eaters (Tyrannosaurids, Troodontids, Dromaeosaurids, and Ornithomimids) and plant eaters (Hadrosaurs, Hypsilophodontids, Ceratopsians, Pachycephalosaurids) (BLM, n.d.). Paleontologists also know that during the last ice age Alaska was populated by a variety of impressive megafauna, including: woolly mammoths, mastodons, steppe bison, Beringian lions, giant short-faced bears, giant sloths, horses, giant camels, and giant wolves, among others (NPS, n.d., “Mammals”). While these creatures are now extinct, some of their contemporaries survived to modern day, including the muskox and caribou (NPS, n.d., “Survivors”).

Archaeology of Alaska and the Arctic is rich with an abundance of tools and other objects left by many culture groups, including the Ipiutak, Okvik, and Birnirk — ancestors to modern-day Eskimo and Inupiat. These objects include toggle-head harpoons, spears, ice scratchers, and oil lamps — implements that suggest a subsistence on marine mammals like seals and whales (UAMN, 2015). The Birnirk culture also left behind tools suggestive of a dependence on land mammals like caribou (NPS, 2014). By studying these tools, the midden (or trash) piles left behind by these people, and by listening to oral history as told by people today, we know that marine species like seals, walrus, whales, and polar bears have existed in the Alaska landscape for millennia.

Though the dinosaurs and megafauna of the past are now extinct, the flora and fauna of modern-day Alaska are no less impressive. Nearly 1,700 kinds of plants exist today in the Arctic and subarctic; these include: “low shrubs, sedges, reindeer mosses, liverworts, and grasses, 400



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varieties of flowers, and crustose and foliose lichen” (UCMP 2006). The fauna in the Arctic is equally diverse and includes herbivorous mammals like lemmings, voles, caribou, arctic hares, and muskox; carnivorous mammals such as foxes, wolves, and bears; many birds including ravens, snow buntings, falcons, loons, sandpipers, terns, snow birds, and various species of gulls and other sea birds; a plethora of insects, such as mosquitoes, flies, moths, grasshoppers, blackflies, and arctic bumble bees; and numerous species of fish: cod, flatfish, salmon, and trout (UCMP, 2006).

Elders and culture bearers in your community can share local names for the most important subsistence flora and fauna in your area. Likely, they will be able to share stories about how these plants and animals have changed over time.

Note that fossilization involves a chemical change from bone to stone. Most of the Pleistocene-era bones of extinct mammals found in Alaska are not technically fossils, they are still bone from which DNA can be extracted.

Vocabulary

fossil – the mineralized remains or traces of a plant or an animal that lived long ago

extinction – the death of all the members of a certain group of organisms

Activity Procedure

1. Set the scene by asking students to imagine what the land surrounding their community could have looked like a long time ago. Invite students to close their eyes as they create a picture in their minds. Guide them to picture a time before there were any buildings, or snowmachines, or gravel pads and roads. Ask them to think about how the plants would look and what kind of animals they would see.
2. Pause and then have students open their eyes. Invite students to share some details of the scene they pictured.
3. Lead a discussion about how we know what we know about the past. (Students may mention movies; how did the moviemakers get their ideas?) If necessary, guide them to consider both oral tradition and fossil evidence. Paleontologists study plants and animals of the past and anthropologists study humans of the past. Both are scientists who have questions about the past, and use fossils, or other remains, to piece together the puzzle.
4. Ask the question to students, “How do animals die?” Write the question on the board and ask students to generate a list of the different ways animals could die. Examples should include: they may be eaten by another animal (including humans), starve, freeze, or die of old age, infection, or disease. Next, write on the board and ask the question “What happens to animals after they die? Again, write responses on the board. Answers could include: eaten and digested by a predator or scavenger, decompose, dry up, get washed away, or become buried. Next ask students if all animals become fossils.



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Explain that it takes special circumstances for a fossil to be formed. It should also be pointed to students that only a small percent of living organisms become fossils. Pass around the fossil samples to show the different types of fossils, so that each student or group of students has a fossil. Ask them to describe their fossil and share with the rest of the class. Students may want to guess what kind of plant or animal the fossil came from. Discuss how the fossil was formed. An answer key is provided with the “Methods of Fossilization Kit”. Here are some basic concepts to incorporate:

Animal fossil

Animal dies -> soft tissue decays, hard portions (shells, bones and teeth) remain
-> buried in sediment

Plant fossil

Plant dies -> leaves imprint in soft mud -> buried in sediment

Footprints

Animal walks across muddy area -> tracks

5. Introduce the game. The game will take us back in time, about 12,000 years. There won't be any dinosaurs; they have been extinct a long time. But it is long before their village was built, and the animals they find may surprise them. Give each child an Animal Card; you may want to allow time for them to act out their animal roles. Once all the animal cards have been handed out and all the animals are milling around the room, call out that it is time to “Freeze”. Then give each child an Event Card, which will determine their fate of whether or not they become a fossil. Have the students each read their card to explain what happened to them. Have the students who became fossils move to one side of the room and the students whose remains were destroyed to the other, to visually represent the ratio.

There are 30 Animal Cards and 30 Event Cards. You should play the game at least 5 times, keeping each round quick. Collect the cards, shuffle, and redistribute. This will help give you a larger sample size to better show probability. Record the results on the board after each round. After a few rounds, ask the students to make a prediction of the number of fossils they will “find” in the next round.

6. Show the poster. All of the animals from the game are on it, and the key explains which are extinct and which are no longer in Alaska. Ask students how they think the artist got his ideas. How is his version similar to what they pictured at the beginning of the lesson? How is it different?

Extension Activity

- “Make a Fossil” activity in HSP IV: Ch. 3, Lessons 3.



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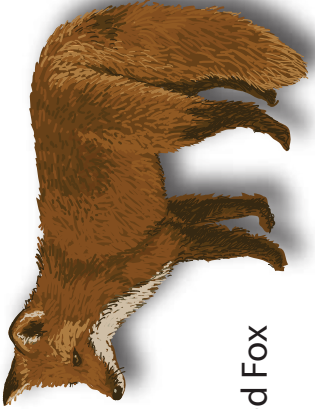








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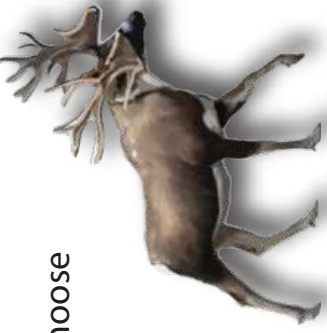








Animal Cards

 <p>Red Fox</p>	 <p>Alaska Tundra Hare</p>	 <p>Grizzly Bear</p>
 <p>Caribou</p>	 <p>Arctic Fox</p>	 <p>Muskox - <i>Ovibos moschatus</i></p>
 <p>Arctic Ground Squirrel</p>	 <p>Lynx</p>	 <p>Lemming</p>

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 <p>Stag-moose</p>	 <p>Dall Sheep</p>	 <p>Ground Sloth</p>
 <p>Wolf</p>	 <p>Saiga Antelope</p>	 <p>Camel</p>
 <p>Helmeted Muskox</p>	 <p>Large-horned Bison</p>	 <p>Badger</p>

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 <p>Moose</p>	 <p>Horse</p>	 <p>Beaver</p>
 <p>Human</p>	 <p>Wolverine</p>	 <p>Mastadon</p>
 <p>Mammoth</p>	 <p>Lionlike Cat</p>	 <p>Yak</p>

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 <p>Great North American short-faced bear</p>		
 <p>Wapiti (Elk)</p>		
 <p>Saber-toothed Cat</p>		

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Dry up	Rot away	Rot away
Dry up	Rot away	Rot away
Dry up	Dry up	Rot away



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Washed away by water	Washed away by water	Eaten by scavengers after death
Rot away	Washed away by water	Washed away by water
Rot away	Washed away by water	Washed away by water

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Eaten by scavengers after death	Eaten alive by an animal	Buried in sediment (mud, dirt, sand, etc.): your harder body parts become a fossil!
Eaten by scavengers after death	Eaten alive by an animal	Eaten alive by an animal
Eaten by scavengers after death	Eaten alive by an animal	Eaten alive by an animal



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<p>You rot away but your imprint or track is buried in sediment (mud, dirt, sand, etc.) and becomes a fossil!</p>		
<p>You rot away but your imprint or track is buried in sediment (mud, dirt, sand, etc.) and becomes a fossil!</p>		
<p>Buried in sediment (mud, dirt, sand, etc.): your harder body parts become a fossil!</p>		