

## Illinois State Museum – Ice Ages

### Physical Adaptations in Ice Age Mammals

**Objective:** Students will identify the body parts, such as hair, teeth, and size that either allowed Ice Age mammals to survive the climate changes of the Ice Age, or caused them to migrate or perish in the Great Extinction.

**Grade Levels:** 8-10

**Time Required:** one class period to read through the Museum’s Midwestern US 16,000 Years Ago Web exhibit section on Ice Age Mammals; one class period to discuss the adaptations of particular structures, such as teeth and hair and how these helped animals survive.

#### Motivation:

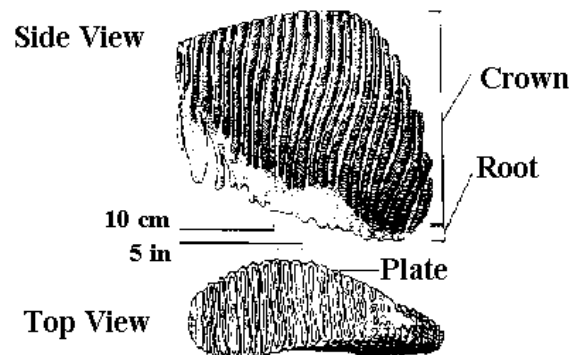
Big Questions:

- 1) How do animals survive during times of climate and habitat change? What are the various scenarios of change and adaptation? By looking at specific animal adaptations in the past, we can learn more about changes that happened then, changes that are happening now, and think about what might happen in the future.
- 2) How do animal species become extinct? Is it always failure to adapt? Are humans ever involved?
- 3) Can humans be involved to prevent animal species from going extinct? What kinds of information and knowledge do humans need in order to do this? How can they obtain this information?

#### Looking at physical adaptations:

##### Teeth: Mammoths

The mammoth tooth pictured in the first diagram shows ridges on the grinding surface of the tooth. This is an adaptation that indicates the diet of the mammoth was probably heavily grasses, which contain large amounts of silica. We know that silica wears down the surfaces of teeth. Two other tooth adaptations in the mammoth solve this problem. The crown of the mammoth tooth is very deep, giving much more tooth to wear down. Mammoths and elephants also stagger tooth replacement. Instead of getting all their teeth in at once, they get them in one at a time; when one gets worn down, another erupts and moves into place.

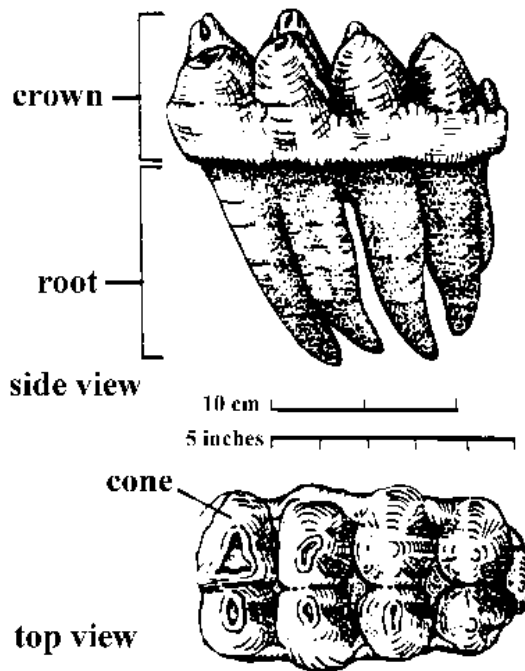


Could mammoths have eaten other plant food successfully with these teeth? If grasslands moved with the climate changes, would the mammoths have followed the grasses they were adapted to eating?

### **Mastodon Teeth:**

The grinding surface of a mastodon tooth, diagramed to the right, shows cone-shaped points, not the ridged surface like in the mammoth tooth. This indicates that the mastodon ate more plant materials such as leaves, stems, flowers, and less grass than the mammoth ate. The points would have crushed the pulpier parts of the plants.

If the climate got colder enough to prevent these plants from growing where mastodons were living, how would the mastodons adapt? Could they eat grasses? Would they follow the climate south to get the plants they were used to?



### **Saber-tooth Cat Teeth:**

The saber-tooth cat's tooth adaptation consisted of a pair of huge canine teeth it may have used to rip open the bodies of the large mammals it preyed on. It is also theorized that the teeth were used for killing bites to the neck or for sexual display.

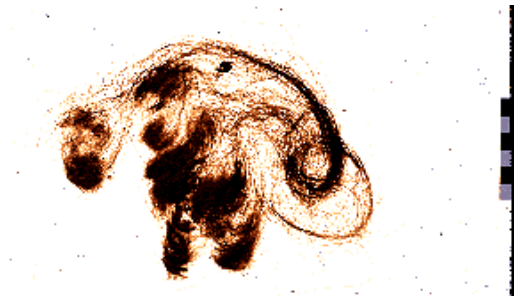
If hunters and climate change decreased the number of large mammals that the saber-tooth cat could find for food, what choices would the cat have? Could it try to capture and eat smaller mammals? Would it have to travel further to find large mammals?



### **Extinction:**

All three of the above large Ice Age mammals became extinct during the last ice age around 11,000 years ago. They failed to adapt to changing conditions. These conditions included drastically cooling temperatures that changed or eradicated the vegetation in their habitat, increased hunting by humans, and perhaps spread of diseases to which they had no immunity.

The teeth adaptations alone were not enough to cause this. Other adaptations large mammals had were the large size that allowed them to retain body heat in the cold and long, thick hair that covered their bodies and that would have kept them warm (or been too warm if the temperatures went up).

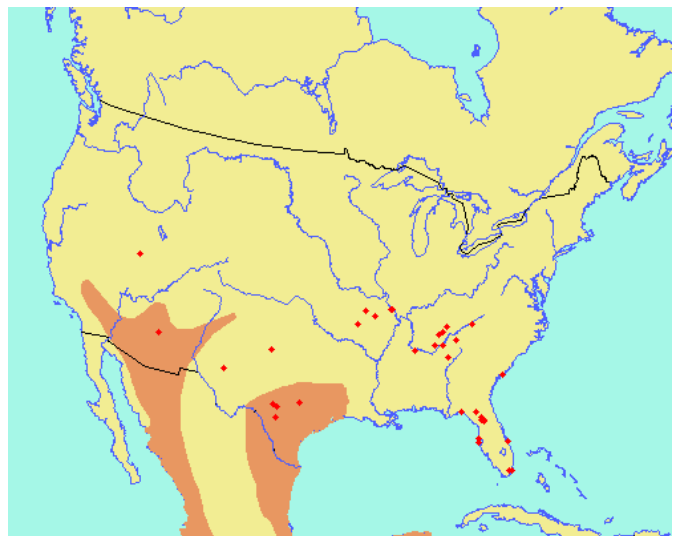


### **Jaguars:**

Let's look at a large mammal that survived the Late Pleistocene Ice Age Extinction — the jaguar.

The jaguar's adaptations include a large size, strong muscles for running, fur for warmth and pattern or color for camouflage. Their prey consisted of small mammals. Looking at the Faunmap for jaguars in the Midwest, we see where the jaguar used to live (red dots of archaeological finds and where it is found today (shaded red area).

We can see that today the jaguar lives in the southern region it lived before the Late Pleistocene Ice Age (Texas and the southwest) and it lives farther south into Mexico and Central America today. We can deduce from this that the jaguar adapted by moving south as the climate got colder, and staying there after the ice melted, having adapted to their new home.



We can also deduce from evidence that the climate of the places in which jaguar remains were found probably had about the same temperatures 16,000 years ago as their modern habitat has today. Although the last glaciers did not come down as far south as the locations of the jaguar remains from the Late Pleistocene, the temperatures in those regions also got cooler. When the temperatures cooled, perhaps the jaguars' prey moved south or died out, and jaguars had to follow or adapt to other food.

### **Extension Assignment:**

Consider the physical adaptations of other Ice Age mammals. Look at the faunmap for each animal. Analyze the locations of the remains and contrast that (if it exists) to the modern day range of the animal. Think about what physical adaptations supported the animal in its survival or contributed to its extinction? Write your conclusions and participate in a discussion of the animals and their adaptations.

**Assessment:**

Students should be able to explain how at least one animal's physical adaptations helped it survive its environment, how the climate changed in the Late Pleistocene, and what the results were for that animal (it adapted to the change where it was; it moved with its food source and climate change; it became extinct).

**Illinois State Board of Education Goals Addressed:****Geography:**

**17.B.3a** Explain how physical processes including climate, plate tectonics, erosion, soil formation, water cycle, and circulation patterns in the ocean shape patterns in the environment and influence availability and quality of natural resources.

**17.B.3b** Explain how changes in components of an ecosystem affect the system overall.

**Science:**

**12.B.3b** Compare and assess features of organisms for their adaptive, competitive and survival potential (e.g., appendages, reproductive rates, camouflage, defensive structures).

**12.B.4a** Compare physical, ecological and behavioral factors that influence interactions and interdependence of organisms.

**12.B.4b** Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns).