

Out of the Ashes: Dawn of the Age of Mammals

INTRODUCTION

This activity explores research shown in the short film [Out of the Ashes: Dawn of the Age of Mammals](#). By watching this film, you'll explore how ecosystems recovered after an asteroid wiped out most of the dinosaurs. You'll also discover how those events shaped the diversity of modern-day plants and animals, and how scientists can use fossils to reconstruct the past and better understand the history of life on Earth. This activity will help you demonstrate what you have learned from the film.

PROCEDURE

Answer the following questions based on the information provided and what you learned from the film. You may want to use the film's transcript as a reference.

1. Corral Bluffs has many fossils from the first 1 million years after the asteroid impact. Use the film to determine whether fossils of the following organisms have been found at Corral Bluffs. Write your answer for each organism as "Yes" or "No" in the table.

Organism	Found at Corral Bluffs? (Yes/No)
Saber-toothed cat	
Crocodile	
Woolly mammoth	
Turtle	
Seal	

2. Decide whether you could use fossils *younger* than 66 million years old to provide evidence for or against each of the following claims. Write your decision for each claim as "Yes" or "No" in the table.

Claim	Evidence from fossils younger than 66 million years old? (Yes/No)
Plant diversity increased after the asteroid impact.	
The body sizes of mammals were more diverse after the asteroid impact.	
Large and small non-avian dinosaurs competed for food sources before the asteroid impact.	

3. The mass extinction after the asteroid impact is called the **K–Pg extinction event**. According to the film, why were fungal spores abundant after the K–Pg extinction event?
 - a. Higher oxygen levels after the K–Pg extinction event helped preserve fungal spores.
 - b. Fungi decomposed dead plants and animals after the K–Pg extinction event.
 - c. Mushrooms and other fungi were common in palm forest ecosystems.
 - d. The debris from the asteroid impact spread fungal spores around the world.
4. Which of the following plant types is often the first to return after natural disasters, such as volcanic eruptions and wildfires?

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- a. algae
 - b. palm tree
 - c. cactus
 - d. fern
 - e. pine tree
5. The film describes the discovery of one of the earliest legumes in the fossil record. According to the film, what did legumes provide that was so significant to some early mammals?
- a. a protein-rich food source for early mammals
 - b. additional fur-growth vitamins to help early mammals survive winter
 - c. an alternative food source for non-avian dinosaurs when they couldn't find prey
6. Who discovered the fossil of the ancient North American legume at Corral Bluffs?
- a. a scientist on the fossil-hunting team
 - b. a graduate student doing research on fossils
 - c. a teenage student on a field trip
 - d. an elementary school teacher taking paleontology courses
 - e. a journalist writing a news story about Corral Bluffs
7. The four events below all happened within the first 1 million years after the K–Pg mass extinction. Put the four events in order from earliest (most distant in time) to latest (more recent in time). Write your order below using the letters A–D.
- **Event A:** growth of palm forests
 - **Event B:** increase in fungi
 - **Event C:** appearance of legumes
 - **Event D:** replacement by ferns
8. The fossils at Corral Bluffs provide evidence for a sudden, significant evolutionary event in the history of mammals. Based on the film, which of the following best describes this development?
- a. the appearance of the first horse-sized mammals
 - b. a relatively rapid increase in size and diversity of mammals
 - c. mammals returning to the oceans (e.g., seals, whales)
 - d. the appearance of the first carnivorous mammals
9. Based on Figure 1, describe what you think Corral Bluffs' ecosystem is like today. For example, what type of climate and plants do you think it has?



Figure 1. The modern-day landscape in Corral Bluffs, Colorado.

10. In the past, Corral Bluffs probably looked very different. Up until 300,000 years after the asteroid impact, it was dominated by fan-leaved palm forests. Today, fan-leaved palm forests are usually found in hot, humid environments with lots of rain. Figure 2 shows a modern-day palm forest in the Amazon.



Figure 2. A fan-leaved palm forest in the Amazon River Basin.

Why do you think Corral Bluffs today (Figure 1) is so different from how Corral Bluffs probably was in the past (Figure 2)? What factors might have changed over time, and how might they have affected the ecosystem?

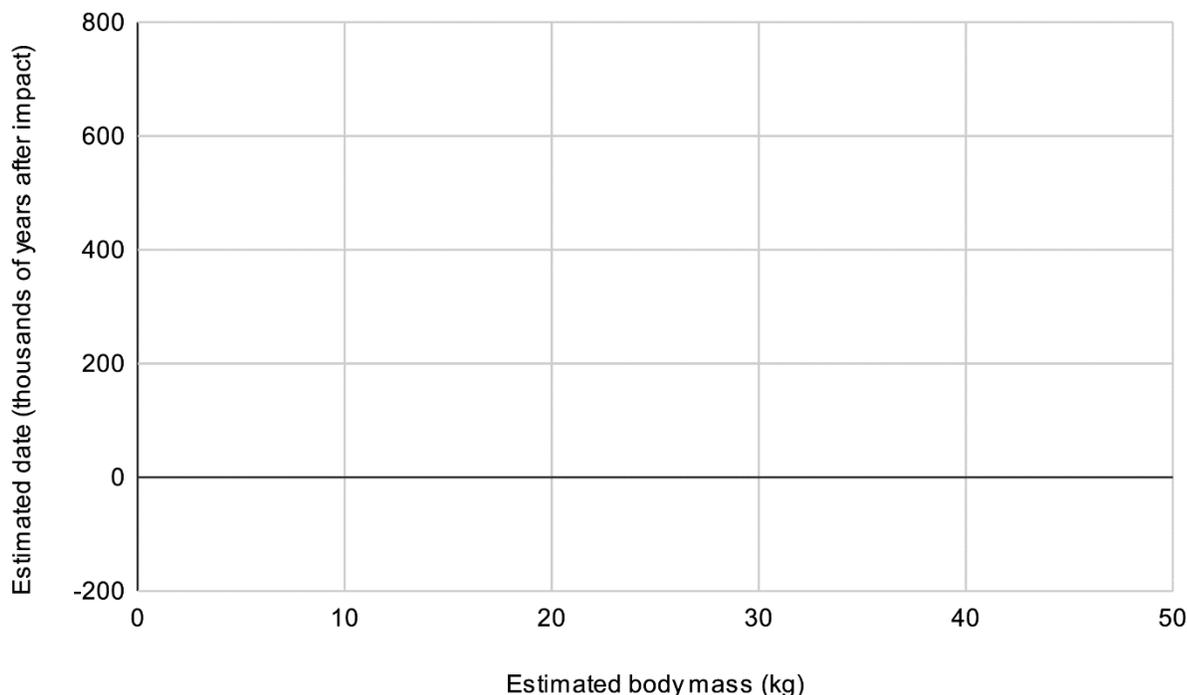
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11. As shown in the film, many fossilized skulls were found at Corral Bluffs. Scientists have used the size of these skulls to estimate the body masses of past animals. Table 1 compares body masses estimated from fossilized mammal skulls to the dates of the fossils.

Table 1. Mammal body masses (kilograms) estimated from fossilized skulls, compared to the estimated dates of the fossils. Dates are in terms of time *after* the asteroid impact (in thousands of years). A date of 0 would be when the impact occurred. Negative dates indicate time *before* the asteroid impact.

Estimated Body Mass (kg)	Estimated Date (thousands of years after impact)
7.5	-140
4.5	90
2.0	510
4.0	610
23.0	420
22.0	540
21.0	680
29.5	690
29.0	760
35.0	790
47.0	660

Follow the instructions below to fill in this graph.



- Plot data points from Table 1 on the graph.
- Two key events occurred over this time period: the asteroid impact and the first appearance of legumes (690,000 years after the impact). Add these two events as horizontal lines on the graph and label each line.

