

American Museum of Natural History

EDUCATOR'S GUIDE

THE SECRET WORLD OF **ELEPHANTS**

amnh.org/elephants-educators

INSIDE

Essential Questions
Map of the Exhibition
Teaching in the Exhibition
Come Prepared Checklist
Correlation to Standards
Glossary

ONLINE

Student Worksheets
Additional Resources



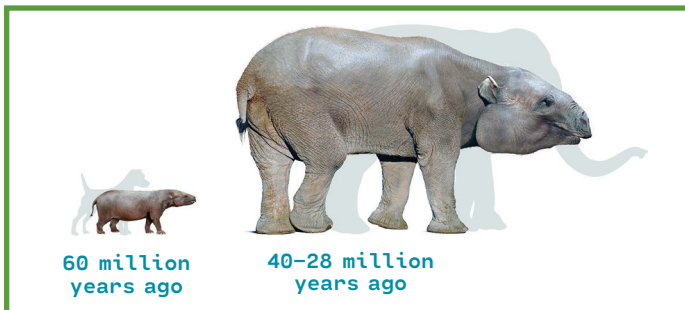
Essential Questions

1. What are elephants?

Elephants are the largest living land animals on Earth. They belong to a group of **mammals** called **proboscideans**, from the word proboscis, meaning nose or trunk. Along with their trunk, which functions as a strong arm and delicate hand as well as a sensitive nose, elephants are characterized by big ears, thick skin, acute senses, long memories, and keen intelligence. Highly social animals, they live in family groups led by older females; males leave the herd in their teens to roam alone or join with other males. Elephants care for their sick, mourn their dead, and remember other herd members and places for many decades.

2. How diverse is the elephant family tree?

Today, there are only three surviving **species** of proboscideans: African savanna elephant (*Loxodonta africana*), African forest elephant (*Loxodonta cyclotis*), and Asian elephant (*Elephas maximus*). However, proboscideans have been around for at least 60 million years and include more than 200 extinct species. They have lived on every continent except Australia and Antarctica, in habitats as varied as swamps, deserts, tundra, and tropical forests. More than a dozen proboscidean species lived into the last Ice Age, sharing the planet with modern humans. The last mammoths went extinct just 4,000 years ago. The closest living relatives of elephants are aquatic mammals called sea cows—dugongs and manatees—and furry, rabbit-size mammals called hyraxes.



Eritherium is the earliest known proboscidean; *Barytherium*, which thrived 40 million years ago, was the size of today's elephants.

3. How are elephants adapted to their environments?

Elephants use their **tusks** for many tasks, such as digging and dueling. They use their hose-like trunk to drink, communicate, and spray cooling water on their thick, wrinkly skin. They can detect sound vibrations not just with their ears, as we do, but also with their sensitive footpads, allowing them to communicate across great distances by

sending low vibrations through the ground. With a better sense of smell than dogs and rats, they can identify individuals and locate distant food sources. They have ridged teeth that are good for shredding grasses and twigs. New teeth grow in from behind as the old ones wear out.

4. How are elephants important to their ecosystems?

Big and mobile, elephants are **keystone species** whose activities affect the **ecosystems** in the **savannas** and forests where they live. They dig water holes, where other species gather to drink and hunt. They clear paths that other animals use. When elephants eat, consuming hundreds of pounds of plants a day, about half of the protein passes through undigested in their dung. Elephants spread plants by dropping seeds in their dung. Plants, fungi, and animals grow in and feed on the dung, and are eaten in turn by larger animals.



Many insects, including butterflies, feed on elephant dung. These insects in turn become food for frogs, birds, and other, larger animals.

5. What is the relationship between elephants and human societies?

For thousands of years, humans have hunted elephants and put them to work hauling burdens, carrying riders, and fighting in wars. Elephants have had an honored role in many religions. And royalty across Asia and Africa have claimed the mighty animals as emblems of their power.

6. How can we protect elephants?

Millions of elephants were slaughtered for their ivory tusks, driving them close to extinction. As people log forests, convert wild land to farms, and build housing, elephants have lost more than 90 percent of their former habitat, which is also threatened by global climate change. To find enough food, many elephants are forced to enter villages and farms, where they eat stored food, trample crops, and drink wells dry. Governments and nonprofit organizations are working with local communities to develop ways to protect people from elephants and elephants from people, such as building better fences and strengthening regulations that preserve habitat.

Map of the Exhibition

1. Evolution

- 1a. Woolly mammoth life-size model
- 1b. Mammoth tusk interactive
- 1c. Dwarf elephant life-size models
- 1d. Mastodon and mammoth touchable fossil teeth

2. Body

- 2a. African savanna elephant life-size model
- 2b. Food-and-water display and touchable tooth
- 2c. Poop models
- 2d. Ivory Interactive

3. Habitat

- 3a. Video wall





4. Mind

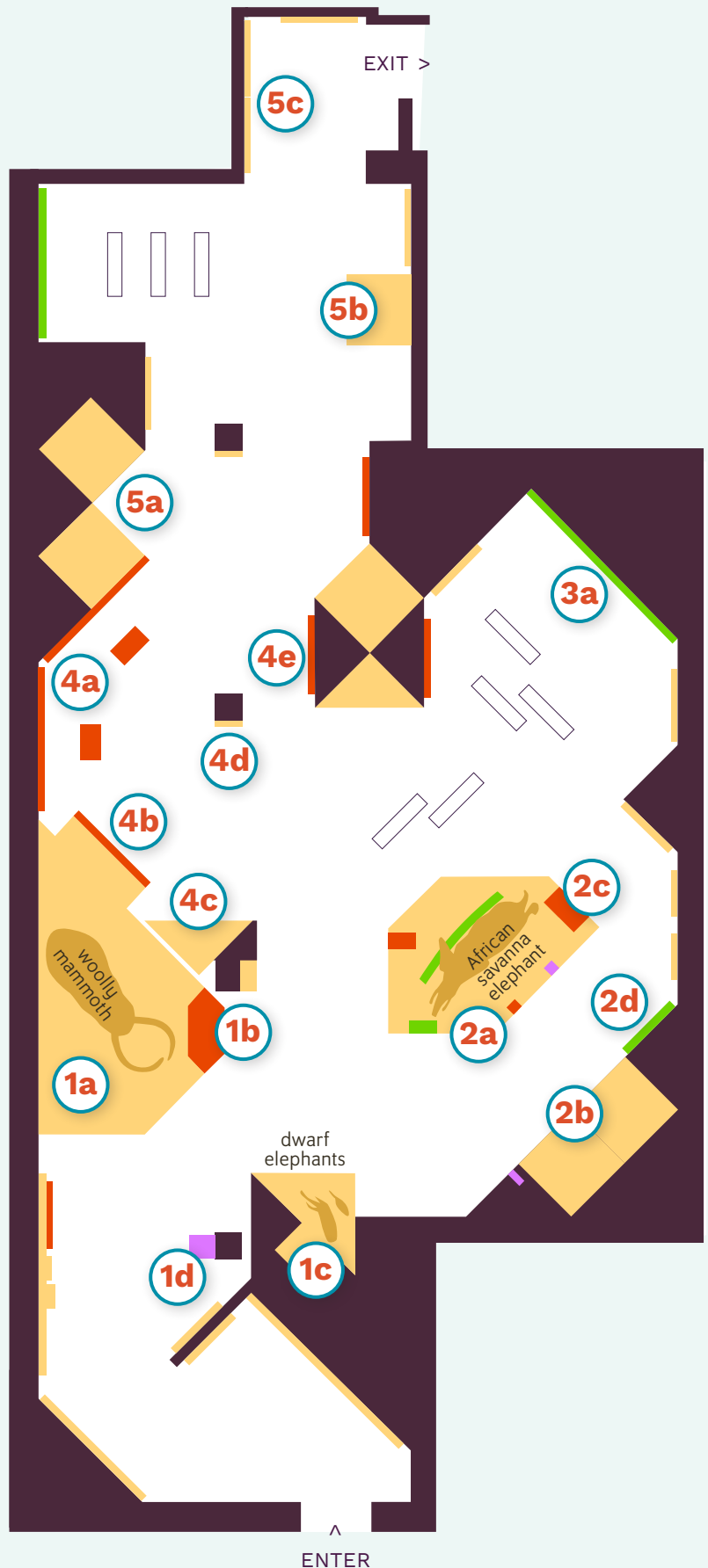
- 4a. Large screen interactive
- 4b. Wall magnets
- 4c. Mini diorama
- 4d. Mirror test
- 4e. Sound buttons

5. Elephants and Us


- 5a. Warfare, work, and tourism cases
- 5b. Religious statue
- 5c. Wall panels

KEY

-  interactive
-  touchable
-  video
-  display or graphic panel



Teaching in the Exhibition

 = number of students that will fit in an area

1. Evolution


In this area, students can meet the proboscideans—a large, diverse group of intelligent, social animals that once ranged across five continents and untold islands.


1a. Woolly mammoth life-size model | 8–10 |

Students can observe the model of the extinct mammal to notice its physical traits (e.g., large size, domed head, spiral-shaped tusks, shedding hair) and the background painting to notice the environment in which it lived. They can draw on their observations to make inferences about how this animal's adaptations helped it survive in its habitat. To explore diversity, students can compare and contrast the model with the panels that show images of other mammoth species.




A model of a woolly mammoth shedding its winter undercoat in an early-springtime Arctic landscape.

1b. Mammoth tusk interactive |  2–3 | Students can hold a sensor to a mammoth tusk model to reveal a particular mammoth's travels—from birth to death—across what is now Alaska about 17,000 years ago. Scientists look for clues to these animals' histories, such as where they went and what they ate, by studying isotopes of different elements in tusks.

1c. Dwarf elephant life-size models |  6–8 | This full-grown adult and child belong to the smallest species in the elephant family. Students can observe the models to notice their physical traits (e.g., small size, short fur, gently curved tusks), and then turn around and compare these traits to those of the woolly mammoth and African savanna elephant models. Students can read panels about island dwarfism—a process by which big species confined to small spaces evolve to become smaller over time as they adapt to limited resources and the absence of predators—and make inferences about the adaptations of the dwarf elephants.


1d. Mastodon and mammoth touchable fossil teeth

|  2–3 | Students can feel the round cusps of a real mastodon tooth and the ridges of a real mammoth tooth to compare their shapes and make inferences about the kinds of food they ate.

2. Body

With their thick skin, dexterous trunks, and keen senses, elephants have many adaptations that allow them to thrive. In this section, students can find out how elephants' bodies support their way of life.

2a. African savanna elephant life-size model

|  15–20 | The African savanna elephant is the largest of the three living elephant species. Students can observe the model with projected animations to notice its physical traits and then infer how these traits help the elephant survive in its habitat. They can refer to a nearby image of a savanna—a grassy landscape with scattered clumps of trees—on the big banners along the wall. Interactive panels explore the functions of various traits:

- **Huge ears** are giant cooling surfaces that release excess heat from the blood circulating inside, helping the elephant stay cool in the hot climate
- **Thick, wrinkly skin** can extend and retract, trapping water to help an elephant keep cool in the sun, or hold mud, which elephants use as sunblock
- **Sparse hairs** keep skin cool by conducting heat away from the skin
- **A long trunk** operates as an arm/hand/hose for gripping things and suctioning water and as a nose for sensing smell
- **Pointed tusks** act as picks and shovels for digging up roots and carving water holes and as weapons against predators and competitors
- **Sensitive foot pads** feel infrasound vibrations that travel through the ground, allowing elephants to communicate across long distances



Animations projected on this African savanna elephant model explore its physical features. The large image on the wall shows its habitat.

2b. Food-and-water display and touchable tooth

| **8–10** | Students can see how much an adult African savanna elephant eats and drinks in one day. They can also feel the ridges of a real elephant's tooth, which is adapted for shredding stiff grass leaves.

2c. Poop models

| **2–3** | Students can take a peek inside three poop models to see how the size, shape, and contents of dung can help scientists figure out the age, species, genetics, and diet of an elephant, and how dung supports plants and animals.



2d. Ivory interactive | **2–3** | Students can touch images on a screen to reveal facts about the trade in ivory and how it was used for objects like piano keys and billiard balls in the United States and is still used for signature seals in Japan. They can read about how the world's demand for ivory has led to the slaughter of millions of elephants and find out what steps are being taken to stop it.

4b. Wall magnets | **3–4** | Students can arrange elephant-shaped magnets on a board to construct herds engaging in different scenarios, such as finding a water hole, protecting calves from a lion, and traveling to a family get-together.

4c. Mini diorama | **3–4** | A miniature scene shows a small herd of African savanna elephants approaching a water hole. Students can observe the model to notice which elephants are paired up, who is alone, who is the leader, and which way the elephants are facing. They can use these observations to infer why it is important for elephants to be a part of a herd.

4d. Mirror test | **1–2** | The ability to recognize oneself in the mirror is a sign of self-awareness. Students can ponder how they identify the person they see in the mirror. They can then consider the implications of the fact that elephants can recognize themselves in the mirror too.

4e. Sound buttons | **3–4** | Students can hear a variety of elephant sounds, from gentle rumbles to vibrant trumpets, and find out what emotions and messages elephants are communicating.

3. Habitat

Proboscideans have thrived in habitats as different as wetlands, dry savannas, and icy tundra. In this area, students can explore how these big animals shape their ecosystems by drinking, foraging, traveling, and even pooping.

3a. Video wall | **10–15** | This six-minute video shows the three living elephant species interacting with their habitats. Panels around the video explore ways elephants benefit their ecosystems, such as clearing paths in dense forests, which are used by other animals; planting trees along the paths by transporting seeds in their poop; and making water holes in hot, dry savannas, which support other plant and animal species.

4. Mind

Elephants rely on their fellow herd members for survival. They protect one another and follow leaders with long memories and problem-solving skills, usually female elders. In this section, students can find out how they use their intelligence to communicate, avoid dangers, and find food and water.

4a. Large screen interactive | **6–8** | Students can take a series of quizzes accompanied by videos to explore aspects of elephant communication and behavior, such as how elephants drink and show affection with their trunks.

5. Elephants and Us

Elephants loom large in human history and imagination. In this section, students can contemplate the cultural importance of elephants to humans, consider what happens when humans encroach on elephant habitat and vice versa, and find out how we can protect these magnificent giants.

5a. Warfare, work, and tourism cases

| **6–8** | Students can examine objects and images that illustrate how humans have used elephants throughout history.

5b. Religious statue

| **6–8** | Students can observe a statue of Ganesh, the Hindu god of good fortune, who has an elephant's head and a human-like body, and read about the symbols associated with him.



An Indian nobleman and aide ride in a howdah in a mural in Rajasthan, India. The elephant handler, or mahout, wields a goad, a tool for communicating with and controlling an elephant.

5c. Wall panels

| **6–8** | After reading these conservation stories, students can discuss why humans should protect elephants and identify one thing they themselves can do to help.

COME PREPARED CHECKLIST

- Plan your visit.** For information about reservations, transportation, and lunchrooms, visit amnh.org/field-trips.
- Read the Essential Questions** in this guide to see how themes in the exhibition connect to your curriculum. Identify the key points that you'd like students to learn.
- Review the Teaching in the Exhibition** section for an advance look at what your class will encounter.
- Download student worksheets** at amnh.org/elephants-educators. Designed for use during your visit, these worksheets focus on themes that correlate to the standards.
- Decide how your class will explore the exhibition:**
 - You and your chaperones can facilitate the visit using the Teaching in the Exhibition section.
 - Students can use the worksheets and/or map to explore the exhibition on their own or in small groups.

CORRELATION TO STANDARDS

A Framework for K-12 Science Education

Disciplinary Core Ideas • LS1.A: Structure and function • LS1.B: Growth and development of organisms • LS1.C: Organization for matter and energy flow in organisms • LS1.D: Information processing • LS2.A: Interdependent relationships in ecosystems • LS2.B: Cycles of matter and energy transfer in ecosystems • LS2.D: Social interactions and group behavior • LS3.A: Inheritance of Traits • LS3.B: Variation of Traits • LS4.A: Evidence of common ancestry and diversity • LS4.B: Natural Selection • LS4.C: Adaptation • LS4.D: Biodiversity and humans

Crosscutting Concepts • 1. Patterns • 2. Cause and effect: Mechanism and explanation • 3. Scale, proportion, and quantity • 6. Structure and function • 7. Stability and change

CREDITS

The Museum gratefully acknowledges the **Richard and Karen LeFrak Exhibition and Education Fund**.

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GLOSSARY

adaptation: a physical or behavioral characteristic that helps an organism survive in a particular habitat; adaptations are evolutionary responses to changing environments

ecosystem: all the living things in a given area (plants, animals, and other organisms), along with the components of their environment (things like air, water, and soil), interacting as a system

infrasound: sound waves with a vibration frequency too low in pitch for humans to hear

isotopes: atoms that have the same number of protons but different numbers of neutrons

keystone species: a species that provides major opportunities for other species within the ecosystem; its removal would significantly alter the ecosystem

mammal: a class of vertebrate animals descended from the common ancestor of living placentals, marsupials, and monotremes; almost all mammals share certain physical characteristics: they have hair, they're warm-blooded, and they produce milk to nurse their young

proboscideans: members of the order Proboscidea, which consists of the three living species of elephants and their many extinct relatives

savanna: a dry, grassy plain with widely spaced trees in tropical or subtropical regions

species: a basic unit of biological classification; a species is typically defined as a group of closely related organisms that share ancestry and characteristics and that can interbreed and produce fertile offspring

tusks: long, pointed teeth, usually paired, that stick out of the closed mouths of animals such as elephants and boars

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