

1  
40- to 50-minute session



## ACTIVITY OVERVIEW

Should people work to protect and save endangered species? Students discuss the plight of the Asian elephant in the context of elephant evolution and extinction. The relationship between mammoths, an extinct elephant species, and modern elephants is introduced as students consider factors that endanger the Asian elephant.

## KEY CONCEPTS AND PROCESS SKILLS

*(with correlation to NSE 5–8 Content Standards)*

1. Students think critically and logically to relate evidence to explanations. (INQUIRY: 1)
2. Biological evolution accounts for the diversity of species developed through gradual processes over many generations. (LIFE SCIENCE: 5)
3. The extinction of a species occurs when the environment changes and the adaptive characteristics of that species are insufficient to allow its survival. (LIFE SCIENCE: 5)
4. Making decisions about complex issues often involves trade-offs— giving up one thing to gain another. (PERSPECTIVES: 4)

## KEY VOCABULARY

**endangered species**

evidence

**extinct**

species

trade-offs

## MATERIALS AND ADVANCE PREPARATION



*For the teacher*

- 1 Scoring Guide: EVIDENCE AND TRADEOFFS (ET)



*For each student*

- 1 Student Sheet 89.1, “Three-Level Reading Guide: Here Today, Gone Tomorrow?”
- 1 Student Sheet 89.2, “Discussion Web: Should the Asian Elephant be Saved?”
- 1 Literacy Student Sheet 1a, “Keeping a Science Notebook” (optional)
- 1 Literacy Student Sheet 4a, “Writing Frame—ET” (optional)
- 1 Literacy Student Sheet 5, “Writing Review” (optional)
- 1 Scoring Guide: EVIDENCE AND TRADEOFFS (ET) (optional)

*\*Not supplied in kit*

Masters for Scoring Guides are in Teacher Resources III: Assessment. Literacy Student Sheets are in Teacher Resources II: Diverse Learners.

## TEACHING SUMMARY

### Getting Started

1. The class briefly discusses the concepts of extinction and endangered species.

### Doing the Activity

2. (LITERACY) Student groups work together to read and discuss the activity.

### Follow-Up

3. (LITERACY, ET ASSESSMENT) The class discusses the issue of saving endangered species.

### Extension

Students can visit the *Issues and Life Science* page of the SEPUP website for more information on the endangered Asian elephant and the possible re-creation of mammoths.



## BACKGROUND INFORMATION

### Extinction


Fossil evidence suggests that extinction has been a part of the history of life on Earth since its inception. The tree of life branches profusely, since species tend to diversify rapidly in new or changing habitats. Life has persisted, relatively unperturbed in the long view, for about 4 billion years. Near exceptions to this persistence are seen in the several significant mass extinctions, such as the Cretaceous/Tertiary boundary extinction of 65 million years ago, that punctuate Earth's history; however, even these may not have ever truly threatened the continuity of life.

Extinction, whether of mammoths or dinosaurs or of less noticeable organisms such as bacteria, results when a particular species does not adapt to environmental change fast enough. In such cases, extinction is the outcome of the process of natural selection. At some point, none of the species' remaining members survive to reproduce. Species judged by scientists to be in imminent danger of extinction are designated as endangered.

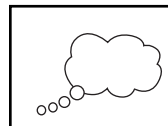
## TEACHING SUGGESTIONS

### ■ GETTING STARTED

1. The class briefly discusses the concepts of extinction and endangered species.

 Ask the class, *Does anyone know of any organisms that have become extinct?* Students are likely to refer to dinosaurs or other pre-historic animals. Ask students, *What does it mean for an organism to be extinct?* Some students may be able to define extinct as “the designation for a type of organism, or species, that existed at some point in the past, but no longer has any surviving members.” Then ask, *What does it mean to be endangered?* Most students are likely to say that the term refers to species that may become extinct, likely in part because their populations are relatively small.

Inform students that they will be considering the issue of whether people should prevent endangered species from becoming extinct. In this activity, they will consider the case of the Asian elephant.

 This symbol represents an opportunity to elicit students’ ideas so the subsequent instruction can take into account students’ current understandings and experiences. Sometimes students’ ideas will reflect partial understandings and relevant everyday experiences that you can build on. Some of their ideas are inconsistent with scientific explanations, but consistent with everyday observations. When this icon appears look to the Teacher’s Guide for additional information.

For more information on identifying and addressing students’ ideas see “Eliciting and Addressing Students’ Ideas” in Teacher Resources II: Diverse Students.

■ **Teacher’s Note:** Natural selection is the major explanatory theory for the evolutionary history of life, including extinctions and endangerment. It will be explored directly in Activities 94 through 98, but several themes in the current activity relate to natural selection, including competition for shared resources (Asian elephants and humans), habitat

change and habitat destruction, and diversification of species over time (evolution of modern elephants). The themes of this activity can serve as a bridge from Unit E, “Ecology,” of *Issues and Life Science*, into this unit.

If students have not completed other *Issues and Life Science* units, introduce the science notebook. Throughout the unit, students keep a science notebook where they record questions, data, observations, hypotheses, and conclusions. Keeping a science notebook helps students process ideas and build scientific writing skills. Literacy Student Sheet 1a, “Keeping a Science Notebook,” lists suggested guidelines. For more information about science notebooks, see the Literacy section of Teacher Resources II: Diverse Learners. These notebooks also help students learn to write lab reports. Formal laboratory reports generally include a title, purpose, introduction, hypothesis, procedure, data, analysis, and conclusions.

### ■ DOING THE ACTIVITY

2. (LITERACY) Student groups work together to read and discuss the activity.

A literacy strategy that accompanies the reading provides students with an opportunity to improve their reading comprehension, particularly of informational text. Student Sheet 89.1, “Three-Level Reading Guide: Here Today, Gone Tomorrow,” guides students through the text and through three levels of understanding: literal, interpretive, and applied. Students look at a list of statements and determine which ones are supported by the text. For more information on Three-Level Reading Guides, see the literacy section of Teacher Resources II: Diverse Learners.

Divide the class into groups of four students. Have each group read and discuss the reading, using whatever reading strategy you deem appropriate for the needs of your students.

Check that students understand the key concepts before having them begin the Analysis Questions. In addition, you may wish to review the graphics with the class, particularly Figures 1 and 2 in the

Student Book. Figure 1 shows a relative timeline of when dinosaurs, mammoths, and people exist(ed) on Earth. Emphasize that the timeline does not show the ancestors of these groups, but only when in time these species (or groups of species, in the case of dinosaurs) existed.

Figure 2 shows some of the evolutionary relationships among some of the major groups in the order Proboscidea (to which elephant species and mammoths belong) over the past 20 million years. With such a diagram, one can compare how closely related various species are: the more recent their common ancestor, the more closely related two species are (see Analysis Question 3a). Point out that, unlike a pedigree, the diagram branches upward. It is the convention to place the oldest species at the bottom of the tree, because their fossils are found in the deepest stratigraphic layers (a concept that will be introduced in Activity 90, “Figuring Out Fossils,” and explored in Activity 93, “Reading the Rocks”). In no way does such an evo-

lutionary tree indicate progress or improvement through time; each species alive at any given time was adapted to its ecological role, or it would have been extinct already!

Students may be surprised that the relationship between the mammoth and the Asian elephant is closer than the relationship between the Asian elephant and the African elephant, since superficially the two elephant species look most similar, especially in terms of amount of hair. Explain that many less noticeable similarities and differences in other areas of physiology must exist.

Possible responses to the reading guide are shown below. Note that the statements 3a, 3b, and 3c (applied level of understanding) do not have a single correct response. Students may interpret information differently and agree or disagree with each statement. Whatever their perspective, it is important that they be able to explain and support their positions.

### Sample responses to Student Sheet 89.1 Three-Level Reading Guide: Here Today, Gone Tomorrow

- Check the statements below that you believe agree with what the reading says. Sometimes, the exact words found in the reading are used. At other times, other words may be used to communicate the same meaning.
  - a. Species that are in danger of becoming extinct are considered endangered.
  - b. A disruption in the food web most likely caused the extinction of the dinosaurs.
  - c. Elephants descended from mammoths.
  - d. Humans and mammoths lived on earth at the same time.
- Check the statements below that you believe represent the intended meaning of the reading.
  - a. Extinct species are gone forever.
  - b. Humans and dinosaurs lived on earth at the same time.
  - c. Although there are theories, reasons for the extinction of the mammoth are still a mystery.
  - d. Elephants in the wild compete with people for food.
- Check the statements below that you agree with, and be ready to support your choices with ideas from the reading and from your own knowledge and experience.
  - a. The people in Asia should be more concerned about saving the Asian elephant.
  - b. Since all species eventually become extinct, the Asian elephant should be allowed to become extinct.
  - c. We should save the Asian elephant even if it is not possible for them to live in the wild, only in zoos.

**Activity 89 • Here Today, Gone Tomorrow?**



As an alternative to a class discussion, you may wish to conduct a walking debate. In a walking debate, you set up designated areas for possible positions students may take on a topic. Students stand in the area of the room that best reflects their opinion about the topic. Students in each area should talk within their groups to create a convincing, evidence-based argument to bring people from the other sites to their own area. Students can also develop questions to ask the other groups. Each group presents their argument and responds to any questions. Students then decide what the most convincing argument is and move to the area that represents their final position. You may use the walking debate strategy with two topics related to this activity.

**Option 1:**

Designate one corner of the room as “we should save the wild populations of the Asian elephant,” a second area of the room as “we should save the Asian elephants, but only in captivity (zoos),” and a third area of the room as “we should not save the Asian elephant.”

**Option 2:**

Designate one corner of the room as “we should recreate the mammoths,” and a second area of the room as “we should not recreate the mammoths.”

More information about the Walking Debate and other discussion strategies can be found in the Literacy section of Teacher Resources II: Diverse Learners.

**■ FOLLOW-UP**

**3. (LITERACY, ET ASSESSMENT) The class discusses the issue of saving endangered species.**

The Analysis Questions are intended as a framework from which to clarify and extend the information presented in the reading. Help students discuss the endangerment of the Asian elephant in the context of elephant evolution and extinction.

There are several Student Sheets suggested for this activity to help students synthesize and communicate their ideas about this issue. They can be used as follows:

After students have completed the Three-Level Reading Guide, use Student Sheet 89.2, “Discussion Web: Should the Asian Elephant be Saved?” to help students organize the information about the issue. Students may also use:

- Literacy Student Sheet 4a, “Writing Frame—ET,” can be used to help some or all of your students construct their responses to Analysis Question 4. This literacy strategy provides a structure for students to communicate their ideas. Also, you can use it to differentiate instruction for students at varying skill levels.
- After students have written their responses to Analysis Question 4, but before you score them, you might have students participate in a writing review, using Literacy Student Sheet 5. A Writing Review is a series of questions that students can

**Discussion Web sample response:**

Yes	Should the wild population of the Asian elephant be saved?	No
There are only two species of elephants left on earth		Mammoths became extinct – ecosystems were OK.
Extinction might damage the ecosystem.		African and Asian elephants are a lot alike.
Other organisms in the ecosystem depend on the Asian elephant.		Elephants compete with people for space.
They are unique - more closely related to mammoths than African elephant.		Elephants compete with people for food.
		Elephants sometimes kill people.

use to evaluate each other's writing. Students can use responses to the review questions to improve or revise their writing.

See the Literacy section of Teacher Resources II: Diverse Learners for more information about these literacy strategies.

Analysis Questions 1 and 2 provide an opportunity for students to synthesize information from the reading. Analysis Question 3b is a quick check formative assessment opportunity to see if students are able to use evidence from the reading to support their responses. If students are still not clear, provide additional instruction.

✓ This icon indicates questions for formative assessment. See Teacher Resources III: Assessment for more information.

Analysis Question 4 is the key question for evaluating the issue of saving the Asian elephants. Students' responses to Analysis Question 4 can be scored using the EVIDENCE AND TRADE-OFFS (ET) Scoring Guide. Additional information about the SEPUP assessment system and scoring guides can be found in Teacher Resources: III: Assessment. If you are using the question as an assessment, review the criteria and scoring guides you will use to assess the question.

To effectively score a response using the SEPUP Scoring Guides, it helps to firmly establish the criteria for a Level 3 response in your mind. Below are sample criteria for an ET Assessment.

Criteria: For a Level 3 response, students must have the following elements:


1. A decision
2. At least two pieces of evidence in support of the decision
3. A description of one trade-off of the decision

## ■ EXTENSION



Students can learn more about attempts to save the Asian elephant from extinction, and the possibility of bringing the mammoth back to life. Have them start at the *Issues and Life Science* page of the SEPUP website.

## SUGGESTED ANSWERS TO QUESTIONS

1.  *What are the similarities and differences between the extinction of mammoths and the possible extinction of Asian elephants?*


Before mammoths become extinct, their population had declined significantly. They had persisted in small herds for a period of 6,000 years. The Asian elephant population has also declined precipitously, although they continue to survive. While we don't know for sure why mammoths became extinct, it's possible that human hunting contributed. If so, this is similar to the situation of the Asian elephants. Destruction of forest habitat and hunting for elephant ivory have contributed to their decline.

A key difference between the two situations is that people can act to save the Asian elephant. It is also likely that people are playing a greater role in the decline of the Asian elephant, particularly with regard to habitat loss. Finally, the population decline is occurring more rapidly in the case of the Asian elephant (over a time span of hundreds of years instead of thousands of years).

2. *Use evidence from this activity to explain why the mammoth could once have been considered an endangered species.*

Between 10,000 and 4,000 years ago, only a small number of mammoths were left on Earth. Most of the mammoths had died off, but a few herds survived. At that time, mammoths could have been considered an endangered species. Eventually, they did become extinct.

Activity 89 • Here Today, Gone Tomorrow?


3.  Some scientists would like to try to re-create a living mammoth by removing the DNA from a fertilized elephant egg and replacing it with mammoth DNA.

- a. Which species of elephant egg do you think scientists should try first? **Hint:** Look carefully at Figure 2.

Figure 2 suggests scientists should try Asian elephants first, since the ancestries of Asian elephants and mammoths branched apart more recently than African elephants and mammoths.

- b. ✓ Do you think scientists should try to re-create a living mammoth? Explain.

Students should support their answers with evidence. Some students may want to re-create a living mammoth because humans contributed to their decline or because of the physiological and behavioral information that could be collected from a living mammoth. Other students may not support this idea because extinction is a natural process that eliminates species that do not adapt quickly enough to new environmental conditions; in addition, students may be concerned that appropriate habitat may not be available for a re-created mammoth, or that a mammoth population might have adverse effects upon other species.

4.  (ET ASSESSMENT) Should people try to save wild populations of the Asian elephant? Support your answer with evidence and discuss the trade-offs of your decision.

**Hint:** To write a complete answer, first state your opinion. Provide two or more pieces of evidence that support your opinion. Then discuss the trade-offs of your decision.

Level 3 Responses

Asian elephants should be saved. Only two species of elephants are left on Earth. The rest became extinct, like the mammoth. That's one reason we should try to save them. Also, they are more closely related to mammoths than to the

African elephant, so they are unique. They could be studied to find out more about the mammoth and maybe what happened to it. Also, other organisms within their ecosystem rely on the Asian elephants. If they disappear it will affect other species. The trade-off is that people will have to share the land they need for crops with the elephants, and some people may be killed.

I don't think people should try to save Asian elephants. After all, mammoths went extinct and nothing bad happened. While Asian elephants are different from African elephants, they are still a lot alike. As long as African elephants are around, I don't think it matters if Asian elephants survive. They need the same space as people, and people are more important. Plus, they kill some people every year. The trade-off is that there won't be any of these elephants left in the wild. This could also change the ecosystem in ways that might affect people.

## Three-Level Reading Guide: Here Today, Gone Tomorrow

1. Check the statements below that you believe agree with what the reading says. Sometimes, the exact words found in the reading are used. At other times, other words may be used to communicate the same meaning.

\_\_\_\_\_ **a.** Species that are in danger of becoming extinct are considered endangered.

\_\_\_\_\_ **b.** A disruption in the food web most likely caused the extinction of the dinosaurs.

\_\_\_\_\_ **c.** Elephants descended from mammoths.

\_\_\_\_\_ **d.** Humans and mammoths lived on earth at the same time.

2. Check the statements below that you believe represent the intended meaning of the reading.

\_\_\_\_\_ **a.** Extinct species are gone forever.

\_\_\_\_\_ **b.** Humans and dinosaurs lived on earth at the same time.

\_\_\_\_\_ **c.** Although there are theories, reasons for the extinction of the mammoth are still a mystery.

\_\_\_\_\_ **d.** Elephants in the wild compete with people for food.

3. Check the statements below that you agree with, and be ready to support your choices with ideas from the reading and from your own knowledge and experience.

\_\_\_\_\_ **a.** The people in Asia should be more concerned about saving the Asian elephant.

\_\_\_\_\_ **b.** Since all species eventually become extinct, the Asian elephant should be allowed to become extinct.

\_\_\_\_\_ **c.** We should save the Asian elephant even if it is not possible for them to live in the wild, only in zoos.



# Discussion Web: Should the Asian Elephant Be Saved?

<b>No</b>				
-----------	--	--	--	--



Should the wild population of the Asian elephant be saved?



<b>Yes</b>				
------------	--	--	--	--

