



OVERVIEW

African elephants are endangered. It is critically important to know how many elephants are left and where they are to guide conservation efforts. In this classroom activity, you will explore the method researchers used to determine the size of the remaining population of African elephants.

Before starting, think about some of the methods you know about for counting population numbers—for example, the number of people in the United States or the number of birds in a park.

Optional warm-up activity

Look at the items in the jar in the front of the classroom. Make a prediction of the number of items in the jar. How many did you guess? _____

What strategy did you use to derive the number above? What challenges does this strategy pose?

Note: Be prepared to discuss your strategy and challenges with the class.

List one or two other strategies and their associated challenges discussed in class.

BACKGROUND

In the 1970s, researchers estimated that 1.3 million forest and savanna elephants thrived in over 35 countries in Africa. Since then, we know that populations of African elephants have been declining at an alarming rate due to habitat destruction and poaching fueled by the international ivory trade.

The Great Elephant Census, a large-scale aerial survey that counted elephants across the continent of Africa, recently determined that only 352,271 African savanna elephants remain. So how did researchers get at this number?

The researchers decided to conduct an aerial survey and they considered two options for counting: they could count every single elephant they saw while flying all over Africa, what's known as a total count, or use an alternative method called a sample count. A sample count involves dividing the survey areas into regions, called strata, of varying sizes. Surveyors then fly along the transect lines to estimate the number in that area, or stratum. Using this method, only elephants seen in the sections of the survey area are counted and used to determine elephant density in that area. These numbers are used to estimate the overall number of elephants based on a mathematical algorithm.

In this activity you will watch a short video about the Great Elephant Census and then simulate doing a sample count and total count and compare your results.



Procedures and Questions

Follow the instructions and complete the questions as you work through the activity.

1. In the chart below, list all advantages and disadvantages you can think of in using a sample count versus a total count for population estimates.

Survey Method	Advantage (+)	Disadvantage (-)
Sample count		
Total count		

2. Watch **The Great Elephant Census**. <http://www.hhmi.org/biointeractive/great-elephant-census>
3. You and a partner will work together to model the method used to take the elephant census using lentils (or beans) and a landscape sheet. Look at the elephant landscape sheet and make sure you are familiar with the parts of the model.



4. Obtain your measurements for the landscape:
 - a. Each transect has two counting strips (one on each side of the plane’s flight path, represented by a dashed line).
 - b. Measure the length of a counting strip in transect A. Record the value in the **length** column below.
 - c. Measure the width of a counting strip in transect A. Now, multiply by 2 (multiplying by two will account for the two counting strips in the transect). Record this value in the **width** column below.
 - d. Determine the area of transect A by multiplying the length by the width and record the value below.
 - e. Repeat steps a-d above for transect B and record the values below.
 - f. Determine the total landscape area by measuring the length and width of the landscape sheet and then multiplying these two measurements.

Area name	Length (cm)	Width (cm)	Area (cm ²)
Transect A			
Transect B			
Total Landscape			

Data Table 1: Transect and Total Landscape Area

5. Your teacher will describe how to obtain your elephants (lentils).
6. You will put the lentils on the landscape sheet using one of the methods below. Once you distribute your lentils, *do not move them* until you complete your total count.

No sheet protector method: one person cups the lentils in both hands about 10 cm above the landscape sheet and in one motion, pulls their hands apart to distribute the lentils. Runaway lentils should be returned to the landscape sheet randomly.

Sheet protector method: make sure the landscape sheet is in a sheet protector and hold it vertically while another student pours in lentils. Then hold the protector horizontally on a table with one hand holding the opening closed and rapidly shake or wiggle the setup for a few seconds to distribute lentils.

7. You will do a sample count first. Before you start counting, your class should agree on how to count the lentils within the counting strips so each group is doing it the same way.



- 8. Once you've counted the lentils for each transect, record the numbers in the data table below.
- 9. Calculate the density of lentils for each transect by dividing the number of lentils counted in the transect by the area of the transect and record in the data table below. *Don't forget to include your units of measurement throughout the activity.*

Transect	Number of elephants spotted in transect	Elephant density in transect $\frac{\text{number of elephants}}{\text{area of the transect cm}^2}$
A		
B		

Data Table 2: Elephant Densities from Sample Count

- 10. Calculate the average density for the transects (add densities from above and divide by 2) and record. Average density of elephants for transects: _____
- 11. Estimate the total number of elephants in the landscape by multiplying the average density by the area of the landscape. Record data: _____
- 12. Now, do a total count for your landscape. Count all of the lentils on your landscape (the entire sheet). Record data: _____
- 13. How similar were the numbers between the sample and total counts on your landscape?
- 14. Now, examine the whole class data. Record each group's data in Data Table 3: Class Data for Elephant Counts on the following page. Once you have data from all of the groups, add the numbers together to complete a total census for the class (can also be done using a spreadsheet).



	Group Number	Total number of elephants in sample count	Actual number of elephants from total count
Totals			

Data Table 3: Class Data for Elephant Counts

- Calculate the total area for the class. Take the landscape area you calculated in Table 1 and multiply it by the number of groups in your class. _____
- Calculate the estimated density of elephants for the class using the class **sample count** data. Take the total number of elephants from the sample count total calculated in Table 3 and divide it by the total area for the class. _____
- Calculate the actual density of elephants for the class using the **total count** data. Take the total number of elephants from the total column in Table 3 and divide it by the total area for the class. _____
- Look at the calculations above. How similar were the numbers between the sample and total counts for the whole class data?

