

**LAB**  
**2** Laboratory  
Activity

## Changes in Predator and Prey Populations

A predator is an animal that kills and eats another animal. A fox is an example of a predator. The prey is the animal killed by a predator. A rabbit is an example of an animal that is prey for the fox.

The sizes of the predator and prey populations can change with time. Biologists sometimes need to know the sizes of certain predator and prey populations. They can sample the population by trapping and/or counting the animals. The result of the samplings changes as the populations change.

### Strategy

You will set up a model of predator and prey populations and observe changes in the results you get from sampling as the populations change. You will construct a graph showing your results.

### Materials

101 brown beans  
17 white beans  
small paper bag  
colored pencils

### Procedure

#### Part A—Sampling a Population

1. Read this report about animals on the abandoned Linworth farm.  
The Linworth farm was abandoned in 1990, when an interstate highway was built through it. In April 1997, two biologists decided to study how the fox and rabbit populations on the 40 hectares of farmland were changing. The scientists counted rabbits by trapping and releasing them and counted foxes with binoculars. The biologists trapped and released 23 rabbits; they saw 2 foxes. The scientist continued their observations in the spring and fall for several years.
2. Put 92 brown beans and 8 white beans into a bag. The brown beans represent rabbits, and the white beans represent foxes. Note that these numbers are four times the observed number of animals in the example above. The observed animals are the sample. The larger numbers represent the numbers of rabbits and foxes in the actual populations.
3. Shake the bag with the beans. Select a bean without looking. Record your results in Table 1 in the Data and Observations section. If you picked a brown bean, put a mark under “observed” in the rabbit column. If you picked a white bean, put a mark in the fox column.
4. Return the bean to the bag. Select another bean, record the result in Table 1 and return the bean to the bag. Repeat this procedure until you have results recorded for 25 beans, which is 25 percent of the actual numbers in the populations.
5. Add together the numbers of brown beans selected. Record the number in Table 1. Repeat for the white beans.

#### Part B—Recording Changes in Populations

1. Examine Table 2, which explains how to change numbers of beans to show how the rabbit and fox populations changed as a result of changes in environmental factors.

## Laboratory Activity 2 (continued)

2. Use the information in Table 2 and the method described in Part A to sample the populations of rabbits and foxes nine more times. Enter your data in Table 3.
  - a. Start with the information for the first date in Table 2, October 1997. Add and remove beans as directed to represent the changes described.
  - b. Select 25 more beans, returning them to the bag each time. Make marks in the appropriate columns in Table 3, and fill in the total number of brown beans and white beans selected.
- c. Repeat this procedure for every date in Table 3. When you come to a date in Table 3 that is not included in Table 2, assume there was no change in the populations. However, conduct a new sampling even though the total populations were unchanged.
3. Fill in the graph on the next page using the data from the population samplings that you recorded in Table 3. Use two different colored columns for each date, one for rabbits and one for foxes.

### Data and Observations

Table 1

Sampling Data				
Date	Rabbits (brown beans)		Foxes (white beans)	
	Observed	Total	Observed	Total
April 1997				

Table 2

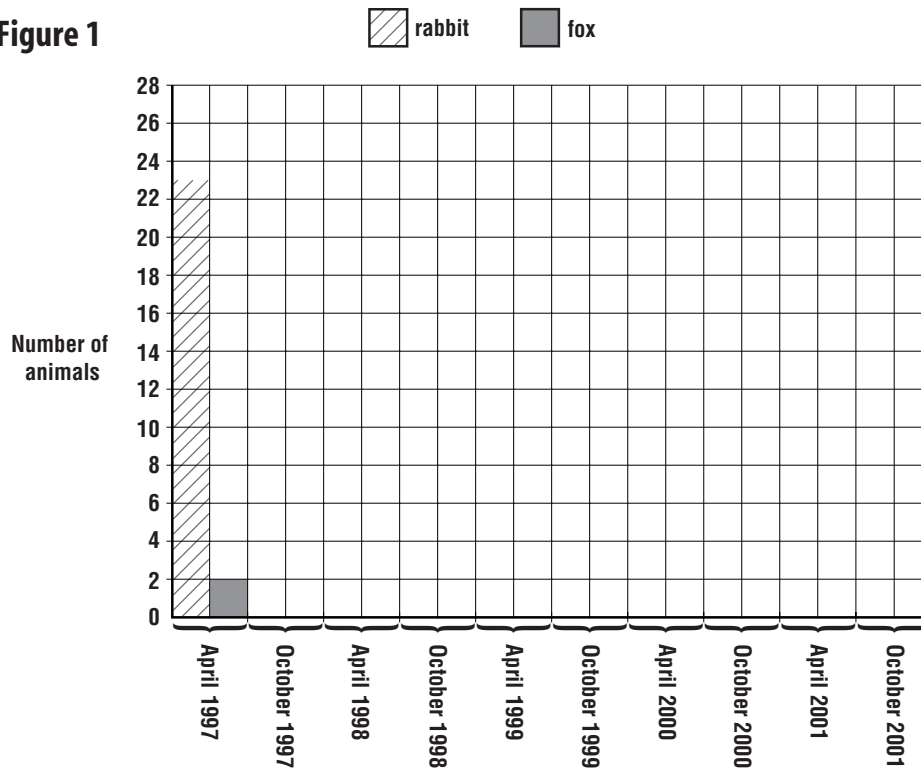
Changes in Population		
Sampling date	Rabbit population	Fox population
October 1997	The winter was harsh, and food was inadequate. Many rabbits died. Remove 10 brown beans.	Foxes ate pheasants as well as rabbits. Fox numbers increased. Add 2 white beans.
October 1998	Food was plentiful. Rabbits moved into the area. Add 15 brown beans.	Foxes had larger litters than usual. Add 2 white beans.
April 1999	Disease killed many rabbits. Remove 8 brown beans.	Food supply was low due to disease among the rabbits. Some foxes left the area. Remove 3 white beans.
October 1999	Spring came early. Rabbits could breed earlier. Add 12 brown beans.	Food was plentiful. Foxes moved into the area. Add 8 white beans.
April 2000	No change in population.	Inadequate food to feed the increased fox population. Some foxes moved out. Remove 4 white beans.
October 2000	The farm was opened to hunters, who killed pheasants. Foxes ate more rabbits. Remove 14 brown beans.	Hunters shot some foxes. Remove 2 white beans.

## Laboratory Activity 2 (continued)

**Table 3**

Population Sampling				
Date	Rabbits (brown beans)		Foxes (white beans)	
	Observed	Total	Observed	Total
October 1997				
April 1998				
October 1998				
April 1999				
October 1999				
April 2000				
October 2000				
April 2001				
October 2001				

**Figure 1**



**Laboratory Activity 2 (continued)****Questions and Conclusions**

1. In this example, which animal is the predator and which is the prey?

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2. How did the data from your sampling in Part A compare with those of the two biologists in April 1997?

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3. Give two factors that caused a decrease in the rabbit population.

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4. Give two factors that caused an increase in the rabbit population.

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\_\_\_\_\_

5. Give three factors that caused a decrease in the fox population.

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\_\_\_\_\_

6. Give three factors that caused an increase in the fox population.

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7. What happened to the rabbits when the pheasant population decreased?

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**Strategy Check**

\_\_\_\_\_ Can you sample populations without counting each individual?

\_\_\_\_\_ Can you demonstrate that populations change over time and seasons?