

Lab: The Ups and Downs of Populations

Essential Question: How is population size affected by different environmental factors?

Background Information:

Limiting factors are biotic (living) and abiotic (non-living) things in an ecosystem that prevent a population from growing any larger. For example, 100 deer may live in an ecosystem that has enough water, cover and space to support 200 deer, but if there is only enough food for 100 deer, the population will not grow any larger. In this example, food is the limiting factor.

Food is not the only factor that can limit population growth. For example, sometimes there is enough food in an ecosystem for a large population, but only a small amount of suitable shelter for the organism. Or maybe there is plenty of food, water, shelter and space to support a larger population in an area, but there are so many predators that it limits the amount of that organism.

Limiting factors are very closely tied to carrying capacity. Carrying capacity is the maximum number of a species that can be sustained by a given ecosystem. In the examples above, the carrying capacity of the deer would be 100 since there is only enough of all the resources for 100 deer to feasibly survive. Many animals can increase in numbers very quickly, and may temporarily exceed the carrying capacity of their ecosystem. When there are too many of a species in an ecosystem, this results in stress, starvation, disease, predation and parasites, poor reproductive success and damage to the habitat. For example, multiplying rabbits can very quickly eat all the vegetation in a grassland ecosystem. With the vegetation gone, food becomes the limiting factor and the rabbits may starve or move to another area (immigration). The grassland now has a reduced carrying capacity for rabbits until the vegetation grows back again.

Increasing or decreasing the limiting factors in an ecosystem will result in an increase or decrease in populations. Some of the limiting factors that are explored in this lesson include food, water, shelter, mates, too many males, too many females, drought, fire, hunters, car traffic, immigration, emigration, predators, dangerous organisms, parasites, and disease.

Objective: Conduct your own population study with a population size of 100 deer. You will be exposing your deer to factors that they commonly encounter in their natural ecosystems and will be evaluating how it impacts the deer population.

Procedure:

1. Draw one card out of the envelope at a time.
2. Read what the card says and record the results in your data table.
 - For example, if the card says that aliens have invaded and have killed 10 deer, subtract 10 deer from your population, record the new number of deer in your population, and then carry the new number into the row below for the next turn.

| Population | Limiting Factor | Effect on Population | New Population |
|------------|-----------------------|----------------------|----------------|
| 100 | <i>aliens invaded</i> | <i>-10</i> | <i>90</i> |
| <i>90</i> | | | |

3. **DO NOT** put the card back in the envelope.
4. Draw the next card and continue drawing and recording data until you have drawn 20 cards and completed all 20 trials.
5. When you are finished with your trials, put all cards back in the envelope.

Use your data table and graph to answer the questions found on Google Classroom