

# Lesson Self-Check

## CAN YOU EXPLAIN IT?

**FIGURE 14:** Wolf reintroduction in Yellowstone National Park had a complex impact on the ecosystem as a whole.



Wolf removal was one of many factors that changed the ecology of Yellowstone National Park from 1926 until the early 1990s. Eliminating a predator helped the elk population rise. Elk and beaver competed for some of the same food resources, including willow trees. As willow trees were reduced by larger elk herds, fewer beavers were able to survive in the park. Fewer beaver dams meant fewer marshy environments, which are ideal willow habitat.



**Explain** Refer to the notes in your Evidence Notebook to explain how the reintroduction of wolves into the Greater Yellowstone Ecosystem might have caused both direct and indirect changes in the populations of so many other species within their ecosystem. Write a short explanatory text that cites specific evidence from this lesson about population dynamics to support your answer.

Interactions within any ecosystem, whether it be large or small, are often very complex. All species within an ecosystem are connected. The impact and causes of change in a system can be difficult to determine. The removal and later reintroduction of wolves in Yellowstone definitely had the potential to cause change. But recent research has called into question how significant their impact really was. While at first there was evidence that aspen and willow growth was occurring immediately after the wolves were reintroduced, long-term studies indicate that this wasn't actually the case.

Research by scientists at Colorado State University that focused on Yellowstone's willows found that the complete removal of wolves from the ecosystem had actually caused permanent changes to the region. When the wolves were removed from the system, elk removed nearly all of the region's willow trees. Without willows to eat, the beaver population decreased. No beavers meant no beaver dams, which caused the once slow-moving waters to now cut deeply into the terrain. As a result, the water table dropped far below the level where willows can survive. Even if the elk population were drastically reduced by the newly reintroduced wolves, willow populations would not recover.

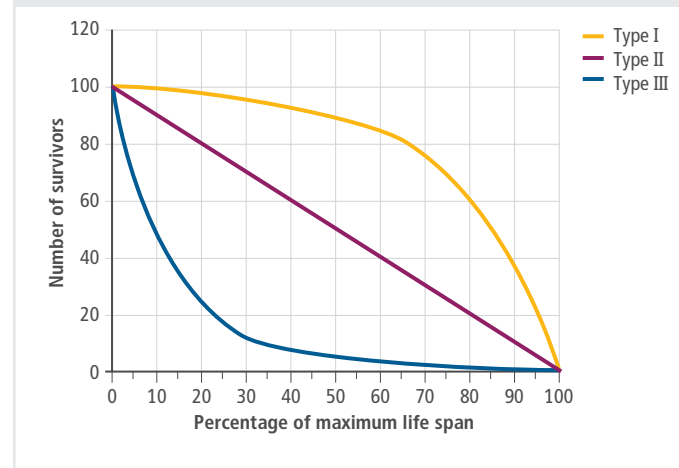
## CHECKPOINTS

## Check Your Understanding

- Which of these abiotic factors would contribute to a clumped dispersion pattern in an ecosystem? Select all correct answers.
  - unlimited water
  - limited water
  - high temperatures
  - limited sunlight
- A population of antelope has a negative population growth rate. Which of these conditions must also be true for the population growth rate to be negative?
  - $\text{births} + \text{deaths} < \text{immigrations} + \text{emigrations}$
  - $\text{births} + \text{deaths} > \text{immigrations} + \text{emigrations}$
  - $\text{births} + \text{immigrations} < \text{deaths} + \text{emigrations}$
  - $\text{births} + \text{immigrations} > \text{deaths} + \text{emigrations}$
- A population of warblers, a type of songbird, experiences a period of exponential growth. Which of these factors would be a density-dependent limiting factor that could decrease the carrying capacity of the ecosystem for this population of songbirds?
  - a competing species moves into the forest
  - a period of lower than normal rainfall
  - a builder removes trees for an office park
  - high winds knock down a quarter of the trees
- A population of deer is displaced by a massive flood in their habitat following a severe rainstorm. The flood is an example of
  - a density-dependent limiting factor.
  - carrying capacity.
  - a density-independent limiting factor.
  - survivorship.
- A population of rodents is introduced on a remote island due to a shipwreck. Eventually, the population reaches the island's carrying capacity. At this point, the birth and death rates are
  - relatively equal.
  - crashing.
  - density independent.
  - density dependent.

Use the graph to answer questions 6–9.

**FIGURE 15:** Survivorship Curves



- A female salamander lays hundreds of eggs at a time. However, after hatching, few of the larvae survive to adulthood. According to the graph, which type of survivorship does the salamander exhibit?
  - Type I
  - Type II
  - Type III
- A songbird has an equal chance of surviving at all stages of its life. According to the graph, which type of survivorship does the songbird exhibit?
  - Type I
  - Type II
  - Type III
- Which survivorship type is associated with parental care?
- What is the connection between survivorship curves and reproductive strategies?
- A herd of zebras has 9 males and 62 females. During a one-year period, 22 foals that are born survive and 25 adults die. Six females join the herd. Three males and 11 females leave the herd. Has the ecosystem reached carrying capacity for the herd? How do you know?
- Draw a graph of logistic growth. Label the point at which the resources for the population are no longer abundant enough to support exponential growth. Explain your reasoning.

## MAKE YOUR OWN STUDY GUIDE

12. A sourdough bread starter is a colony of yeast that bakers keep alive, sometimes for years. The bread is made by removing a portion of the colony, which is replaced by adding back an equal volume of a solution of water, sugar, and flour. Is the starter a model for exponential growth or logistic growth? Explain your reasoning.
13. Describe three advantages an individual organism might have by living in a population with a clumped dispersal pattern.
14. A population of algae that lives in a pond is limited in size by the amount of sunlight that strikes the pond's surface. Is sunlight a density-dependent or density-independent limiting factor for the algae population? Explain your answer.
15. What might cause exponential growth to occur only for a short period when a new species is introduced to a resource-filled environment?



In your Evidence Notebook, design a study guide that supports the main idea from this lesson:

**Populations grow in predictable patterns and are limited by resource availability.**

Remember to include the following information in your study guide:

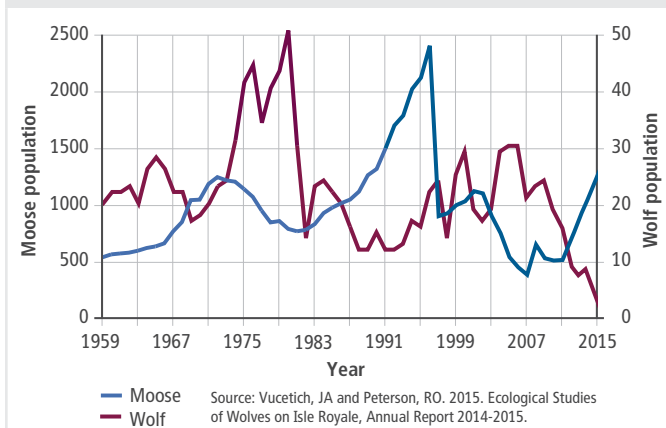
- Use examples that model main ideas.
- Record explanations for the phenomena you investigated.
- Use evidence to support your explanations. Your support can include drawings, data, graphs, laboratory conclusions, and other evidence recorded throughout the lesson.

Consider how ecological factors such as resource availability limit population growth.

Use the graph to answer Questions 16–18.

### Density-Dependent Limiting Factors

**FIGURE 16:** Predator–Prey Interactions on Isle Royale



16. How does the wolf population on Isle Royale affect the carrying capacity of the moose population?
17. Is there evidence from the data to suggest that the wolf population crashed? What might have caused this population crash?
18. Is there evidence from the data to suggest that the moose population crashed? What might have led to this population crash?