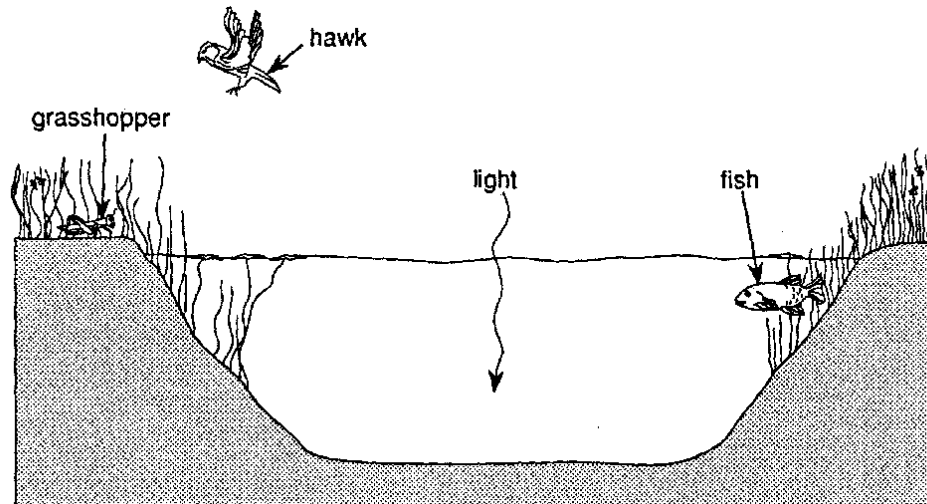


Name: \_\_\_\_\_

## Limiting Factors & Carrying Capacity (Constructed Response)

1. Requirements of some submerged aquatic plants in a pond include oxygen and carbon dioxide dissolved in the water as well as nitrates and magnesium in the mud where the plants grow. What term would be used to describe the resource which is in shortest supply?
2. The diagram below represents a pond ecosystem.



Which labeled part of the ecosystem above is an abiotic factor that functions as a limiting factor for the autotrophs?

3. Every population is linked, directly or indirectly, with many others in an ecosystem. The table below shows the size of the moose and wolf populations that live on an island in Lake Superior.

**Moose and Wolf Populations**

	Population Size	
Year	Moose	Wolves
1960	610	22
1965	733	28
1970	1295	18
1975	1355	41
1980	910	50
1985	1115	22
1990	1216	15
1995	2422	16
2000	850	29

Identify two limiting factors that keep the wolf population size from growing any larger.

4. Aquarium X is a healthy, balanced aquarium. Aquarium Y has become overpopulated with guppies. Adrian has decided to move some of the guppies from aquarium Y to aquarium X.



- (a) Name one biotic and one abiotic factor that will be affected by adding new guppies to aquarium X.

Biotic factor:

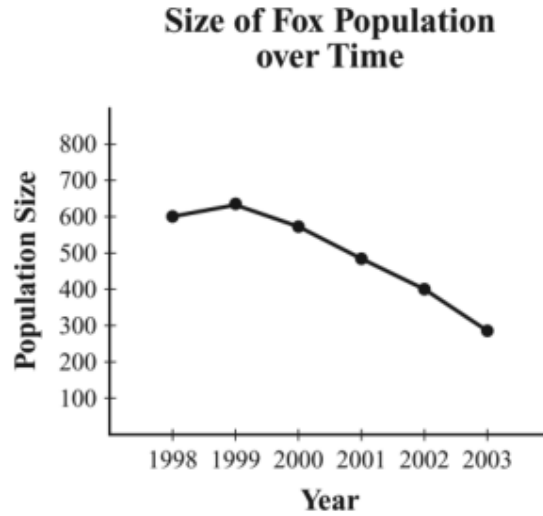
Abiotic factor:

- (b) Describe one short-term and one long-term effect of adding the new guppies to aquarium X.

Short-term effect:

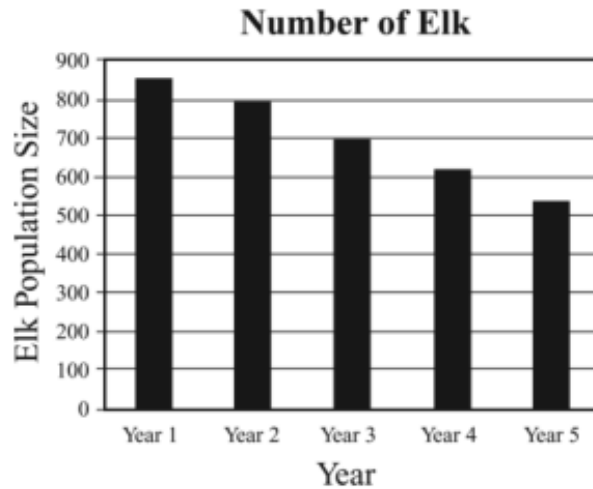
Long-term effect:

5. The following graph the changes in the size of a fox population over time.



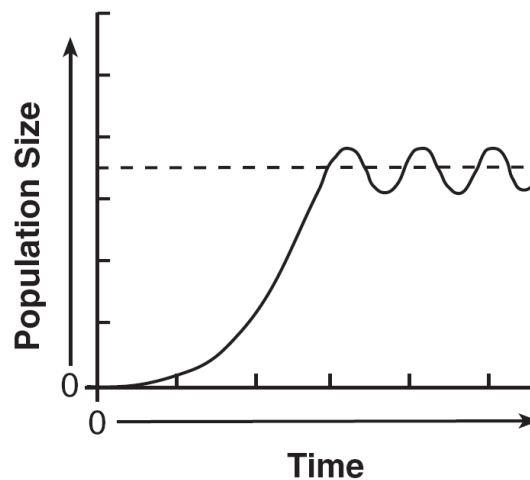
- (a) Identify three different factors that could have caused the overall decrease in the fox population.
- (b) Explain, in detail, how each factor you identified in the previous question would have caused the decrease.

6. Elk are members of the deer family. These herbivores move in herds from the high mountain pastures to the lower valleys and wooded areas throughout the seasons. Their fur color ranges from gray to dark brown which allows them to blend into the dense wooded areas. Natural enemies of the elk include bears, cougars, wolves, and coyotes. The graph below shows how the number of the elk in an area has changed over time.



Based on the data, one student concludes that an elk predator was introduced into the area during this time period. State a likely alternate explanation for the change in the elk population.

7. The graph below shows the changes in the size of a fish population over a period of time.



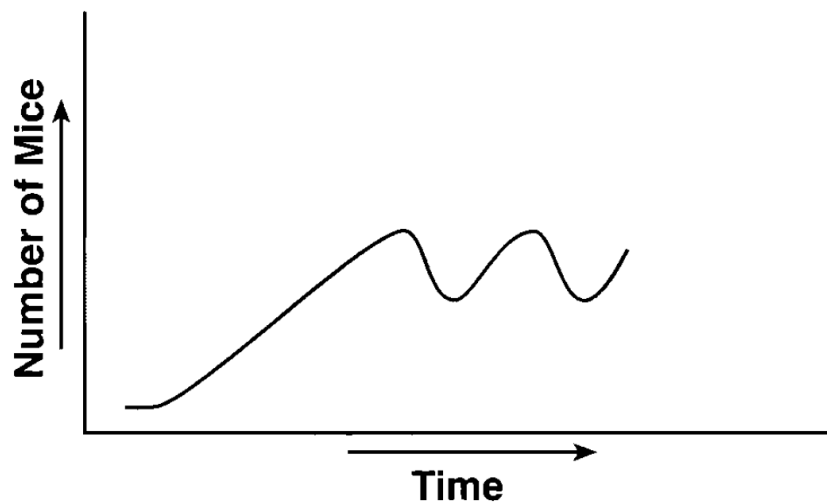
What does the dashed line on the graph represent?

8. A scientist is studying the carrying capacity of a population of fur seals living on an island off the coast of Alaska.

(a) Define the term carrying capacity.

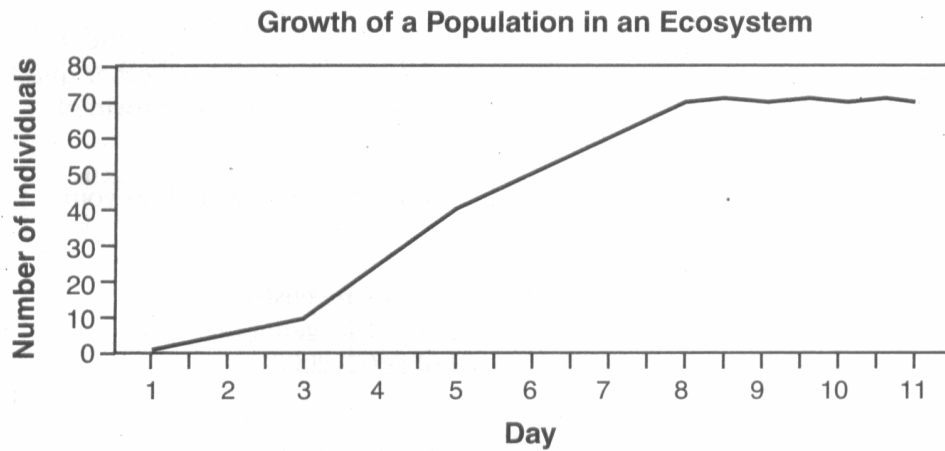
(b) Identify and explain three factors that affect the carrying capacity of the fur seals' environment.

9. The graph below shows the growth of a field mouse population in an ecosystem over time.



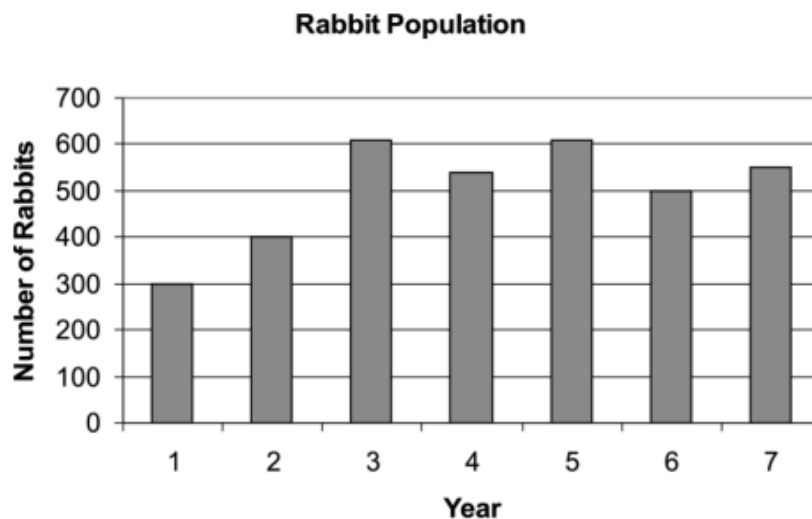
On the graph above, draw a dashed line to represent the carrying capacity for the field mouse population.

10. The following graph shows the growth of a population in an ecosystem.



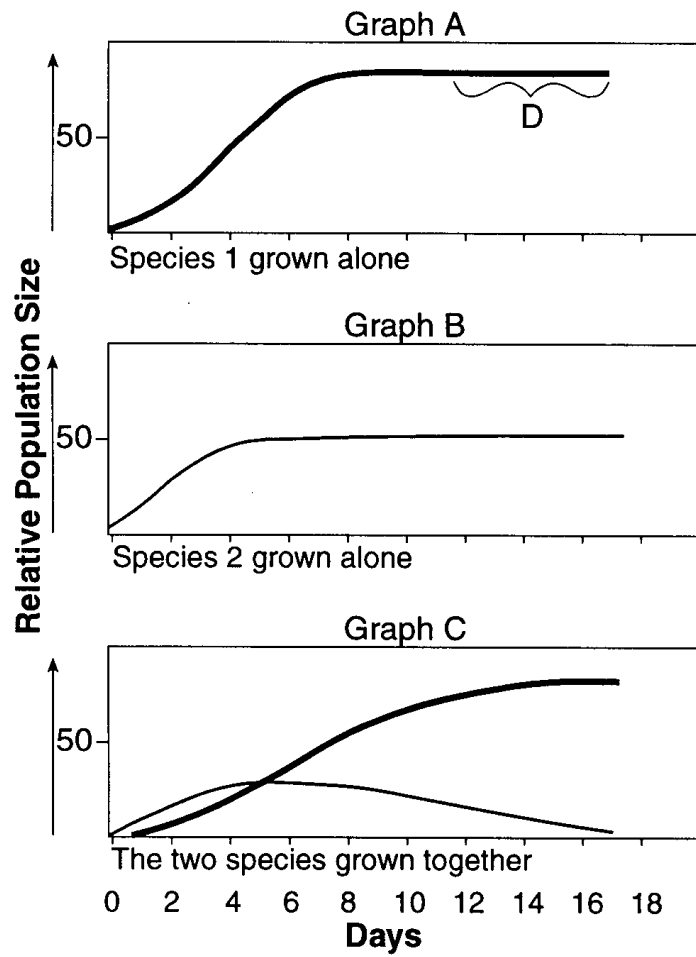
- (a) On which day did the population reach the carrying capacity of the ecosystem?
- (b) What is the approximate carrying capacity for this population in this ecosystem?

11. The graph below shows the change in rabbit population over 7 years.



The graph above shows the population of rabbits in a field over a seven-year period. Based on the data, what is the approximate carrying capacity in the field for rabbits?

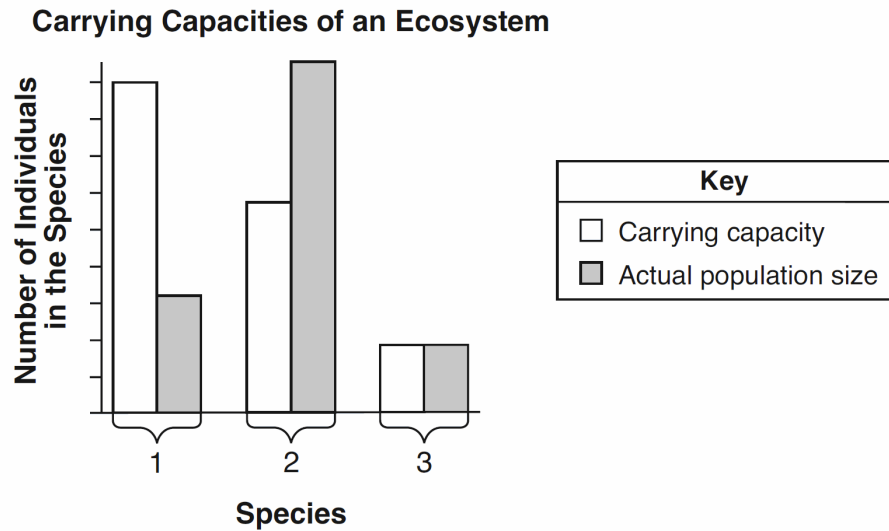
12. The graphs below show the relative population size of two closely related species of microorganisms grown under identical conditions in culture dishes.



In graph A, what causes the population to level off at letter D?



13. The graph below shows the carrying capacities of an ecosystem for three different species, 1, 2, and 3, that inhabit an area and the actual population sizes of these three different species in the area.



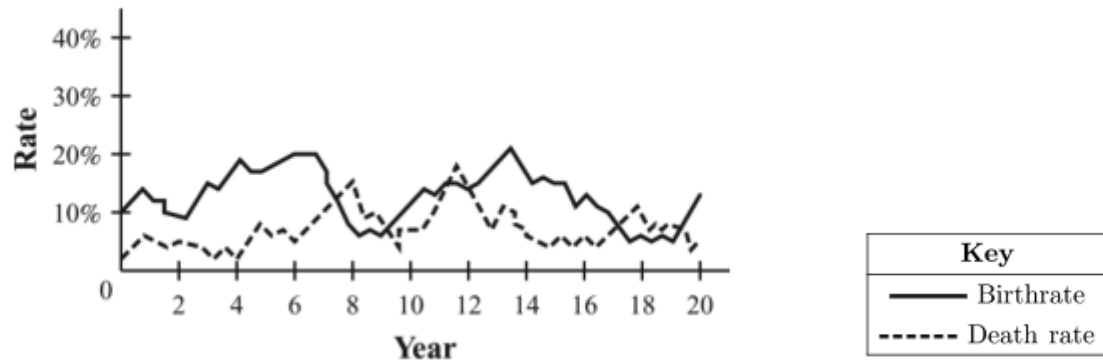
Identify which species population would most likely have the greatest competition among its members. Support your answer using information from the graph.

Species number: \_\_\_\_\_

Explanation:

14. The following graph shows changes in the birth rate and death rate for a large population of deer over a 20-year study period.

**Changes in Deer Birthrate and Death Rate over Time**



- (a) Describe and explain two factors that can affect the birthrate in the deer population.
- (b) Describe and explain two factors that can affect the death rate in the deer population.
15. Identify one time period on the graph during which the deer population was increasing. Explain your answer.

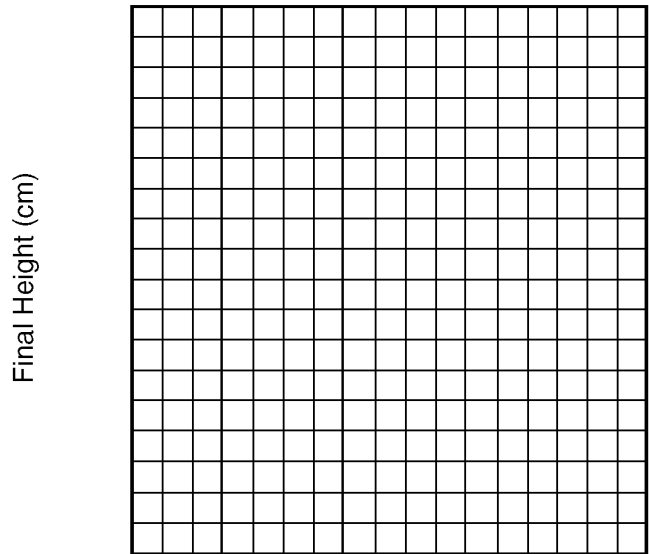
16. In an investigation, plants of the same species and the same initial height were exposed to a constant number of hours of light each day. The number of hours per day was different for each plant, but all other environmental factors were the same. At the conclusion of the investigation, the final height of each plant was measured. The following data were recorded:

8 hours, 25 cm      2 hours, 5 cm      12 hours, 35 cm      6 hours, 18 cm  
 4 hours, 12 cm      14 hours, 35 cm      10 hours, 34 cm

**Data Table**

Daily Light Exposure (hours)	Final Height (cm)

**Effect of Light Exposure on Plant Growth**



- Organize the data by completing both columns in the data table provided, so that the hours of daily light exposure increase from the top to the bottom of the table.
- On the graph, mark an appropriate scale on each axis.
- On the graph plot the data for final height on the grid. Surround each point with a small circle and connect the points.
- State one possible reason that the plant exposed to 2 hours of light per day was the shortest.

- (e) If another plant of the same species had been used in the investigation and exposed to 16 hours of light per day, what would the final height of the plant probably have been? Support your answer.