HANDS-ON ACTIVITY
Modeling Carrying Capacity

In this activity, your group will represent heron families that must catch fish to survive. In each generation, you will calculate the number of surviving individuals based on the amount of food collected. You will then graph the heron population over time to analyze the factors that affected your population.

MATERIALS

For each group
- tray or paper, 21 $\times$ 27 cm^2
- uncooked beans (50)

For each student
- paper cup

PREDICT
How do changes in environmental factors affect the predation habits of the blue heron?

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PROCEDURE

1. Form groups of four students. Assign one member to make a data table to record data for the group.

2. Place 50 "food units" (beans) on the tray.

3. For the first generation, you must collect two food units to survive. Taking turns, collect two food units at a time.

4. Record the number of surviving individuals in your data table. The number of surviving individuals for the first generation should be four.

5. Place all the food units back in the tray.

6. In the next generation, everybody in the group will have one offspring. To survive, you must collect two food units for yourself and two food units for each offspring.

7. Select a different group member to go first this time. Take turns collecting food, two units at a time, until everybody has enough food for themselves and their offspring. Record the number of surviving individuals for this generation (the second generation).

8. Repeat Steps 5–7 eight more times, recording the number of surviving individuals at each generation. The number of offspring that survive each generation depends on the amount of food that is gathered. For example, if your family consists of you and four offspring, but you only collect six food units, two of your offspring will die.

9. In the 11th generation, runoff containing large amounts of nitrates causes an algal bloom in the lake. When the algae die and decomposition occurs, the oxygen level in the lake becomes very low, causing fish to die. Place 30 food units in the tray instead of 50.

10. Repeat Steps 6 and 7 and record the number of surviving individuals in your data table.

11. In the 12th generation, the food stock is starting to recover. Place 40 food units in the tray.

12. Repeat Steps 6 and 7 and record the number of surviving individuals in your data table.

13. In the 13th generation, the food stock has completely recovered. Place 50 food units in the tray.

14. Repeat Steps 6 and 7 and record the number of surviving individuals in your data table.

15. In the 14th generation, predators are abundant. Each person loses two offspring to predators.

16. Repeat Steps 6 and 7 five more times and record the number of surviving individuals in your data table.

ANALYZE

1. In your Evidence Notebook, or on a separate sheet of graph paper, graph your data. Include a title and appropriate labels.

2. How was the amount of food caught by a heron related to changes in biotic and abiotic factors?

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3. How might abundant amounts of food allow herons to reproduce more often?

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4. How would the populations of amphibians and small reptiles be affected if the fish population in the lake remained low for an extended period of time?

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