



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

## Student Exploration: Food Chain

**Vocabulary:** consumer, ecosystem, energy pyramid, equilibrium, food chain, population, predator, prey, producer

**Prior Knowledge Questions** (Do these BEFORE using the Gizmo.)

The *Food Chain* Gizmo shows a **food chain** with hawks, snakes, rabbits, and grass. In this simulation, the hawks eat snakes, the snakes eat rabbits, and the rabbits eat grass.

1. **Producers** are organisms that do not need to eat other organisms to obtain energy.

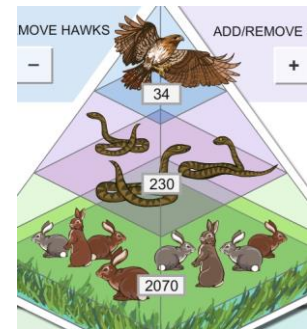
A. Which organism is a producer in this food chain? \_\_\_\_\_

B. Where does the producer get its energy? \_\_\_\_\_

2. **Consumers** must eat other organisms for energy. Which organisms are consumers in this food chain? \_\_\_\_\_

### Gizmo Warm-up

The SIMULATION pane of the Gizmo shows the current **population**, or number, of each organism in the food chain.



1. What are the current populations of each organism?

Hawks: \_\_\_\_\_ Snakes: \_\_\_\_\_ Rabbits: \_\_\_\_\_ Grass: \_\_\_\_\_

2. Select the BAR CHART tab, and click **Play** (▶). What do you notice about each population as time goes by?

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If populations don't change very much over time, the ecosystem is in **equilibrium**.

3. Notice the populations decrease as you go from the bottom of the food chain to the top. Why do you think this is so? \_\_\_\_\_

\_\_\_\_\_

This diagram, showing decreasing populations at each level, is called an **energy pyramid**.



<b>Activity A:</b> <b>Predator-prey relationships</b>	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> <li>• Click <b>Reset</b> (↺).</li> <li>• Check that the <b>BAR CHART</b> tab is selected.</li> </ul>	
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**Question:** **Predators** are animals that hunt other animals, called **prey**. How do predator and prey populations affect one another?

1. Observe: Run the Gizmo with several different starting conditions. You can use the **+** or **-** buttons to add or remove organisms, or you can choose **Diseased** from the dropdown lists.
2. Form hypothesis: How do you think predator and prey populations affect one another?

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3. Predict: Based on your hypothesis, predict how changing the rabbit population will affect the other organisms at first. Write “Increase” or “Decrease” next to each “Prediction” in the table.

<b>Change</b>	<b>Grass</b>	<b>Snakes</b>	<b>Hawks</b>
Doubling rabbit population	Prediction: Result:	Prediction: Result:	Prediction: Result:
Halving rabbit population	Prediction: Result:	Prediction: Result:	Prediction: Result:

4. Test: Add rabbits until the population is about twice as large as it was (200% of balance). Click **Play**, and then **Pause** (⏏) after approximately ONE year. Next to each “Result” line in the table, write “Increase” or “Decrease.” Click **Reset** and then halve the rabbit population (50% of balance). Record the results for this experiment in the table as well.

A. How did doubling the rabbit population affect the grass, snakes, and hawks at first?

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B. How did halving the rabbit population affect the grass, snakes, and hawks at first?

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**(Activity A continued on next page)**



**Activity A (continued from previous page)**

5. Predict: Predict how changing the snake and hawk populations will affect the other organisms within the first year. In the tables below, write your predictions.

<b>Change</b>	<b>Grass</b>	<b>Rabbits</b>	<b>Hawks</b>
Doubling snake population	Prediction: Result:	Prediction: Result:	Prediction: Result:
Halving snake population	Prediction: Result:	Prediction: Result:	Prediction: Result:

<b>Change</b>	<b>Grass</b>	<b>Rabbits</b>	<b>Snakes</b>
Doubling hawk population	Prediction: Result:	Prediction: Result:	Prediction: Result:
Halving hawk population	Prediction: Result:	Prediction: Result:	Prediction: Result:

6. Test: Click **Reset**. Try each experiment with the Gizmo. Record each result after one year.

A. How did increasing the snakes affect the grass? \_\_\_\_\_

Explain why: \_\_\_\_\_

\_\_\_\_\_

B. How did increasing the hawks affect the rabbits? \_\_\_\_\_

Explain why: \_\_\_\_\_

\_\_\_\_\_

7. Draw conclusions: In general, what effect did removing prey have on predators? \_\_\_\_\_

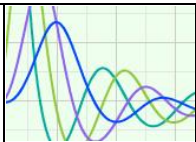
\_\_\_\_\_

What effect did removing predators have on prey? \_\_\_\_\_

\_\_\_\_\_

Extend your thinking: In North America, many top predators, such as wolves, have been driven nearly to extinction. What effect do you think this has on their main prey, deer? Write your answer on a separate sheet, and/or discuss with your classmates and teacher.



<b>Activity B:</b> <b>Long-term changes</b>	<u>Get the Gizmo ready:</u> <ul style="list-style-type: none"> <li>• Click <b>Reset</b>.</li> <li>• Select the GRAPH tab.</li> </ul>	
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**Question: An ecosystem is a group of living things and their physical environment. How do ecosystems react to major disturbances?**

1. Observe: Kill off most of the hawks using the – button, and then click **Play**. Observe the GRAPH for about 12 years, and then click **Pause**. What happens?

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2. Analyze: Explain why you think the population of each organism changed the way it did. (Use extra paper if necessary.)

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3. Experiment: Click **Reset**. Try making other changes to the ecosystem. Use the + or – buttons, or choose **Diseased** from the dropdown lists. Click **Play** and observe for at least 12 years. Record what happens on another sheet of paper or in your notes.

4. Summarize: Give at least one example of each of the following:

A. A major disturbance that the ecosystem was able to recover completely from.

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B. A major disturbance that caused the ecosystem to stabilize at a new equilibrium.

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C. A major disturbance that caused the ecosystem to completely collapse.

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D. (Challenge) A major disturbance that *almost* caused a total collapse, but that the ecosystem was able to recover from eventually.

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