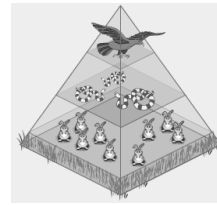


Name \_\_\_\_\_

Period \_\_\_\_\_

### Food Chain Gizmo [www.explorellearning.com](http://www.explorellearning.com)



Many areas in the United States are currently experiencing unusually large populations of deer. This affects farmers, whose crops are eaten by the deer; homeowners, whose gardens and lawns are being destroyed; and insurance companies, who are paying claims caused by accidents between cars and deer.

Much of the increase in the deer population is the result of mankind's eliminating most of the deer's natural predators from the ecosystem, such as mountain lions, grizzly bears, and wolves. These species were seen as a threat to livestock, but they also served to control the population of deer.

Now some species are being reintroduced into ecosystems from which they had been totally eliminated. One highly publicized effort is the reintroduction of wolves into Yellowstone National Park. Scientists are watching the ecosystem there very closely to monitor the effects of the wolves.

### Exploring Disease in a Single Species

You will begin this activity by examining the food chain of a stable ecosystem. You will then explore the effects that disease and sudden variations in population can have on the ecosystem.

- In the Gizmo™, look at the food chain represented by the pyramid. A species in this food chain eats the species just below it, and is eaten by the species just above it.



- In this ecosystem, what do snakes eat? \_\_\_\_\_ What eats the snakes? \_\_\_\_\_
- What do rabbits eat? \_\_\_\_\_
- There is nothing below the grass on the food chain. How does grass "eat"? \_\_\_\_\_

- Click Play (▶) to start the simulation. Time begins to pass as indicated by the days counter in the lower-right corner of the Gizmo. Watch the numbers of each species in the **SIMULATION** pane. Notice that none of the populations fluctuate over time. Record the initial (baseline) numbers below:  
Hawks \_\_\_\_\_ Snakes \_\_\_\_\_ Rabbits \_\_\_\_\_ Grass \_\_\_\_\_

- Click Reset (↺). In the **SIMULATION** pane, under Rabbit, select Disease. This will introduce a disease into the rabbit population. With the **BAR CHART** pane visible, click Play. After about 28 days, pause the simulation and examine the data in the **BAR CHART** pane.

- What happens to the population of rabbits over time? \_\_\_\_\_
- Which populations increase? \_\_\_\_\_
- Do those species lie above or below the rabbits in the food chain? \_\_\_\_\_
- Which populations decrease? \_\_\_\_\_
- Where do those species lie relative to rabbits in the food chain? \_\_\_\_\_
- Click on the **GRAPH** tab to display a graph showing by what percentage each population has changed from its ideal level in this food chain. At the right of the graph, click - to zoom out from the graph so you can see more of the vertical range. In this graph, a value of -100% means that a species has reached a population of zero. Which species' populations reached a value of -100%? \_\_\_\_\_  
Which species reached -100% first? \_\_\_\_\_ Second? \_\_\_\_\_ Third? \_\_\_\_\_ Offer an explanation for this order. \_\_\_\_\_



- Did the disease in the ecosystem cause a permanent or temporary change in the populations of these four species? \_\_\_\_\_ Explain how you can tell. \_\_\_\_\_
- Click Reset. In the **SIMULATION** pane, under Snake, select Disease from the dropdown menu to introduce a disease into the population of snakes. With the **GRAPH** pane visible click Play to start the simulation.
  - What happens to the population of hawks over time? \_\_\_\_\_
  - Offer an explanation for this change. \_\_\_\_\_
  - What happens to the population of rabbits? \_\_\_\_\_
  - What might explain this change? \_\_\_\_\_
- Click Reset. This time, under Hawk, select Disease.
  - What happens to the populations of the other species in this case? \_\_\_\_\_

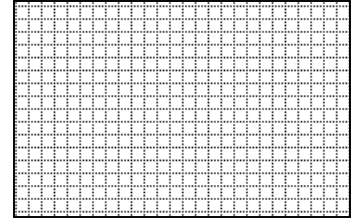




2. Offer an explanation for these changes. \_\_\_\_\_

7. Make a hypothesis about what would happen to the populations of the four species if the grass were diseased.  
\_\_\_\_\_

8. Sketch a **rough** graph to illustrate your hypothesis. Use the Gizmo to check your answer. Were you correct? \_\_\_\_\_



### The Effects of Changes in Initial Population

*In this activity, you will explore how a change in the size of the population of a single species affects the populations of the other species in the ecosystem.*

1. Click Reset. In the **SIMULATION** pane, under Snake, click + to add snakes until the population of snakes reaches about 30. Click on the **GRAPH** tab. Click Play. When the animation reaches 25 days, click Pause.
  1. With the extra snakes, how did the hawk population change in the first week? \_\_\_\_\_
  2. How did the rabbit population change in the first week? \_\_\_\_\_
  3. What might explain these changes in population? \_\_\_\_\_
  4. How did the population of snakes change over the 25 days? \_\_\_\_\_
  5. Explain why you think that occurred. \_\_\_\_\_
  6. Did the larger-than-normal number of snakes in the ecosystem cause a permanent or temporary change in the populations of these four species? \_\_\_\_\_
  7. Explain how you can tell. \_\_\_\_\_
  8. If you start with 50 snakes instead of 30 snakes, what do you think will happen to the populations of the four species over time? Make a hypothesis and then click Play to check your answer. \_\_\_\_\_
  9. Were you correct? \_\_\_\_\_

2. Click Reset. Under Rabbit, click + to add rabbits until the rabbit population reaches about 400. Click Play. Pause the simulation after about 28 or 30 days.
  1. Over the first few days of the experiment, which populations are increasing? \_\_\_\_\_
  2. Which are decreasing? \_\_\_\_\_
  3. Explain why, with the food chain in mind. \_\_\_\_\_
  4. After about two weeks, is each population above or below its ideal? \_\_\_\_\_
  5. Is each increasing or decreasing? \_\_\_\_\_  
Offer an explanation for these observations. \_\_\_\_\_
  6. After 28 days, how does the population of each species compare with its ideal number? \_\_\_\_\_
  7. Do you think that this food chain will return to its initial ideal state? \_\_\_\_\_
  8. Why or why not? \_\_\_\_\_
  9. Restart the simulation run this experiment again to check your answer.



3. Click Reset. Under Snake, click – until this system has only 3 snakes. Before starting the simulation, describe any changes that you expect to occur in each species over time. \_\_\_\_\_  
\_\_\_\_\_



Click Play to start the simulation and check your expectations.

4. Perform your own experiments to answer the questions below. Be sure to click Reset before each experiment.
  1. If all four species begin with a higher than ideal population, what happens to the populations over time?  
\_\_\_\_\_
  2. If all four species begin with a lower than ideal population, what happens to the populations?  
\_\_\_\_\_
  3. If some species start with a lower population than ideal while other species start with a higher population than ideal, what happens? \_\_\_\_\_

**Make sure to complete the online follow-up assessment questions!!!! They could show up later 😊**