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

**Student Exploration:** **Prairie Ecosystem**

**Vocabulary:** carnivore, consumer, ecosystem, equilibrium, extinct, food chain, herbivore, organism, population, prairie, producer

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

An **ecosystem** consists of all **organisms** (living things) in an area, plus the natural landscape.



A **prairie** is flat or gently rolling grassland with few trees, such as in parts of central United States and Canada.

Organisms often found in a prairie ecosystem include prairie dogs, swift foxes, black-footed ferrets, and of course the grass itself.

1. Which organism (grass, prairie dog, ferret, or fox) do you think is a **producer** (does not depend on other organisms for its food)? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Organisms that depend on other organisms for food are **consumers**. Which consumer you think is a **herbivore** (eats plants only)? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Which consumers are **carnivores** (eat meat)? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Gizmo Warm-up: Life on the Prairie**



1. The **population** of prairie dogs is all the prairie dogs living in the village. In the Gizmo, what are the starting numbers of

Grass: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Prairie dogs: \_\_\_\_\_\_\_\_\_\_\_\_\_

Ferrets: \_\_\_\_\_\_\_\_\_\_\_\_\_ Foxes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Click **Advance year** 10 times. On the DATA tab, look at the **Bar graph** and the **Line graph**. Do the populations change very much, or are they in **equilibrium** (stable)? Explain.

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| **Activity A:** **Grass** | Get the Gizmo ready: * Click **Reset**.
* Be sure **Show populations** is selected.
 | 647SE2 |

**Question: How is grass important to a prairie ecosystem?**

1. Observe: Remove ALL animals from the prairie by clicking the minus (**–**) button next to each animal many times. Click **Advance year** 20 times. Does grass survive by itself? Explain.

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Because grass does not depend on other organisms for food, it is a producer. Grass gets what it needs from the Sun, air, and soil.

1. Predict: Click **Reset**. Predict what will happen to the prairie dogs, ferrets and foxes if half of the grass were removed. Write “increase” or “decrease” in each blank below.

Prairie dogs: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Ferrets: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Foxes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Experiment: Remove about half of the grass by clicking the minus **–** button. There should now be about 2,000 tons of grass. Click **Advance year** twice, and look at the **Bar graph** or the **Line graph**. What happened to each population—increase or decrease?

Prairie dogs: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Ferrets: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Foxes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Think about it: What do you think will happen if you continue advancing years?

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1. Experiment: Test your prediction by clicking **Advance year** until 20 years have passed.
	* 1. What do you notice? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		2. Does the ecosystem return to equilibrium? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		3. How do you know? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Extend your thinking: Suppose a fire swept through the prairie. The animals ran away, but about half the grass was burned. What would be the long-term results of this natural event?

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| **Activity B:** **Making a food chain** | Get the Gizmo ready: * Click **Reset**.
 | 647SE3 |

**Question: How do animals affect the prairie ecosystem?**

1. Form hypotheses: What do you think each animal in the food chain eats? (Experiment with the Gizmo to help you make your hypotheses.)

Prairie dogs eat \_\_\_\_\_\_\_\_\_\_\_\_. Ferrets eat \_\_\_\_\_\_\_\_\_\_\_\_\_. Foxes eat \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. Predict: Based on your hypotheses, predict how the changes below will affect the other animals. Write either “increase” or “decrease” next to each “P” (for “prediction”) in the table.

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| **Change** | **Grass** | **Prairie dogs** | **Ferrets** | **Foxes** |
| Addprairie dogs | P: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_A:  |  | P: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_A:  | P: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_A:  |
| Add ferrets | P: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_A:  | P: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_A:  |  | P: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_A:  |
| Add foxes | P: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_A:  | P: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_A:  | P: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_A:  |  |

1. Test: Click **Reset**. Add as many prairie dogs as the Gizmo allows. Click **Advance year** once. Record the effects on the other three organisms in the table next to “A” (for “actual”). Then click **Reset** and do the same with ferrets, and then again with foxes.
2. Analyze: In a **food chain**, each animal eats only one other animal or plant. Based on your experiments, what is the food that each animal eats? Explain how you know.

Prairie dogs eat \_\_\_\_\_\_\_\_\_\_\_\_. Ferrets eat \_\_\_\_\_\_\_\_\_\_\_\_\_. Foxes eat \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

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

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1. Apply: Now complete the *Prairie Ecosystem* food chain. Arrows point toward the animal that is *eating*. For example, “Mouse → Hawk” would mean that the mouse is eaten by the hawk.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Activity C:** **Long term changes**  | Get the Gizmo ready: * Click **Reset**.
 | 647SE4 |

**Introduction:** Once common, the black-footed ferret is an endangered animal. In 1986 there were only 18 black-footed ferrets alive; today there are almost 1,000.

**Question: What would happen to the ecosystem, long-term, with no black-footed ferrets?**

1. Form a hypothesis: Based on what you have seen so far, what do you think would happen if black-footed ferrets died out, or went **extinct**? Explain in detail.

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1. Experiment: Click **Reset**, and remove all the ferrets from the prairie dog town. Click **Advance year** for 12 years. What happens?

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1. Analyze: Why did removing ferrets have such a powerful effect on the prairie ecosystem?

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1. On your own: Investigate other major changes to the prairie ecosystem. Run each experiment for 20 years to see what the long-term results would be.
	1. Give an example of a change that the ecosystem was able to recover from and return to equilibrium. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* 1. Give an example of a change that the ecosystem was not able to recover from. Can you explain why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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