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.

Prairie dog   Black-footed ferret   Swift fox
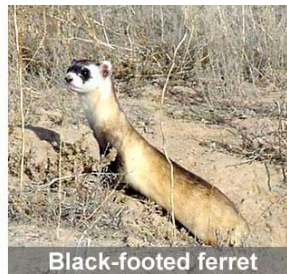
1. Which organism (grass, prairie dog, ferret, or fox) do you think is a **producer** (does not

   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: _____

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

   _____

| Activity A: Grass | Get the Gizmo ready:
• Click **Reset**.
• Be sure **Show population** is selected. | |

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.

   _____

   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.

2. 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: _____

3. 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** once, and look at the **Bar graphs** or the **Line graph**. What happened to each population—increase or decrease?

   Prairie dogs: _____ Ferrets: _____ Foxes: _____

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

   _____

5. Experiment: Test your prediction by clicking **Advance year** until 20 years have passed.

   A. What do you notice? _____

   B. Does the ecosystem return to equilibrium? _____

   C. How do you know? _____

6. 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?

   _____

   _____

Activity B: Making a food chain	Get the Gizmo ready: • Click **Reset**.	

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 _____.

2. 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.

Change	Grass	Prairie dogs	Ferrets	Foxes
Add prairie dogs	P: A:		P: A:	P: A:
Add ferrets	P: A:	P: A:		P: A:
Add foxes	P: A:	P: A:	P: A:	

3. 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**.
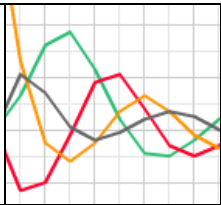
4. Analyze: In a **food chain**, each animal eats only one other animal or plant. Based on your experiments, what is the food that each animal eats? Explain how you know.

   Prairie dogs eat _____. Ferrets eat _____. Foxes eat _____.

   Explain: _____

   _____

   _____

5. 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.

   _____ → _____ → _____ → _____

Activity C: **Long term changes**	Get the Gizmo ready: • Click **Reset**.	

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.

   _____

   _____

   _____

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

   _____

   _____

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

   _____

   _____

4. 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.

   A. Give an example of a change that the ecosystem was able to recover from and

      return to equilibrium. _____

      _____

   B. Give an example of a change that the ecosystem was not able to recover from. Can

      you explain why? _____

      _____