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# Activity: Animal Interactions - Pikas & their Predators

**How do predator & prey populations interact with each other over time?**

**Purpose:** Ecology- Population- Energy Relationships- Predator Prey-Colorado Connection

## Museum Connection:

At the museum, just like the zoo, we have scientists who study wild animals in the field. Students get an opportunity to engage in the practices of science used by our real-world scientists. Also, be sure to come visit our wildlife dioramas on the second and third floors of the museum to learn all about Colorado and North American animals.

**Videos:**

**WATCH Video 1:** Scientists in Action: Protecting Pikas- With the Front Range Pika Project (4:48)

**WATCH Video 2:** Scientists in Action: Protecting Pikas- With Conservation Biologist: Erica Garoutte PhD (6:00)

## Main Idea: (Introduction)

**figure 1- A pika**

**figure 2 A Long-tailed weasel**

In the videos that you watched you learned about one of Colorado's most amazing (and adorable) small mammals, the ***pika***, who lives near the top of mountains. You observed them gathering food. But pikas can also ***be*** food for other animals. In particular, pikas are sometimes caught and eaten by an animal called the ***long-tailed weasel***. With its long narrow body, it is one of the few animals that can go in between the boulders where pikas like to hide.

Animals, like the weasel, hunt and eat other animals are called ***"predators".*** Animals that get eaten by other animals, like the pika, are called ***"prey".*** A group of animals of the same type, who live in the same place at the same time are called a ***"population".*** In this activity, you will play a game to see how weasels control the size of the pika population and how pikas control the size of the weasel population.

**Background Information For Educator/Parent:** (see below. Do not reveal to student doing this activity)

**Suggested Age Group:** Ages 10-17

**Activity Time:** 45-60 min

**Prep Time:** 5-10 min

**Materials** (Alternatives below)

- chalk
- meter stick (or something straight that length)
- pencil or pen 2 colors
- 50 Index cards (representing pikas)
- 20 Sheets of heavy construction paper (8.5”x11) (representing long-tailed weasels)

## AT- HOME ALTERNATIVE MATERIALS

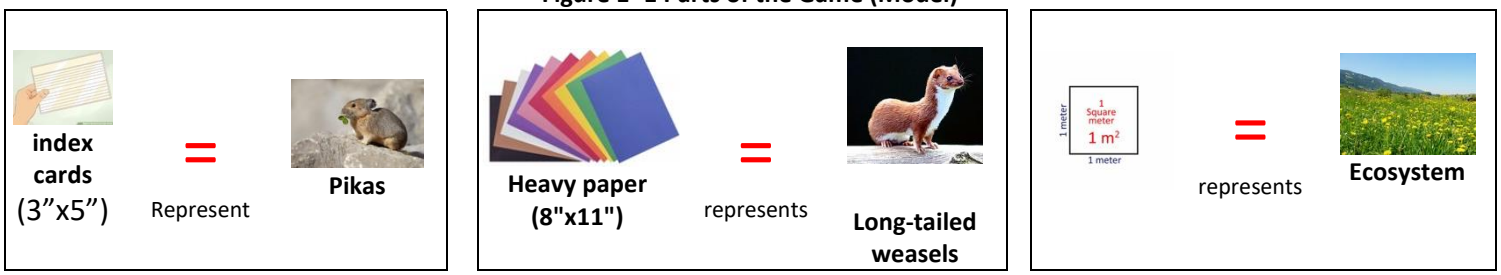
| | |
|---|---|
| • **Index card Replacement**- you can cut pieces of any paper to that size 3”x 5”<br>• **Chalk Replacement-** you can use tape or string to make lines. Painter’s tape works well because it doesn’t stick to carpet | • **Meter Stick Replacement**- To measure, you can use a yardstick OR anything that is the length of a yardstick (e.g., the length from the fingertips of one hand to the shoulder of the opposite side of an average adult).<br>• **Construction Paper Replacement-** Any heavy paper or cardboard or cardstock that is approximately the size of a yard stick (e.g., heavy cardboard such as file folders) |

## Learning Outcomes

***At the completion of this activity the student should be able to:***

**1) USE** a model to **INFER** how predator-prey relationships effect population sizes
**2) COLLECT & RECORD** data in a preset table
**3) GRAPH** data on a two-axis graph
**4) ANALYZE** a graph **& INTERPRET** it to make claims about cause and effect in predator-prey relationships

**Figure 1- 1 Parts of the Game (Model)**




## Step-by-Step Instructions:

1. Start by watching the two videos about pikas linked above.

### Setting Up the Game (The Model)

2. **NOTE:** In this investigation, the index cards will represent ***pikas*** (prey), and the construction paper cards will represent ***long-tailed weasels*** (predators). The box will represent the ecosystem where they live. ***(See figure 1 above)***
3. Using chalk (or masking tape) and a meter stick to mark a one-meter square outline boundary on a sidewalk or floor.
4. **Assigning Jobs**: This activity can be done alone, but if you are working with a group, one student will toss and count the long-tailed weasel cards. Another student will pick up and count the captured pika cards. A third student will be the recorder.

5. Evenly scatter **ten** pika (prey) cards into the square area on the floor. The pika cards should not touch each other.

## Playing the Game (Using the Model)

6. Starting with two long-tailed weasel cards (construction paper), stand about a half meter away from the square.
7. One at a time, slowly drop the two long-tailed weasel (predator) cards, so that they fall into the square. Do not aim them at the index cards. Just let them fall. If they lay partially outside the square that is ok. If the long-tailed weasel card misses the box completely, pick it up and throw it again.
8. Note that Year 1 in the data table below has been filled in for you. There are 10 pikas and 2 long-tailed weasels ***(see figure 2 below)***
9. You have now started the game! Here are the rules to follow from now on:

(First, find those that died)

a) The pika cards that have been **touched by, or lie underneath the long-tailed weasel** cards are **"captured, eaten, and dead"**. Remove them from the game and place them to the side.

b) Any long-tailed weasel card that **does NOT touch** any of pika cards **"did not eat and starved and died".** They should also be removed from the game. Set them aside.

(Now find those that lived)

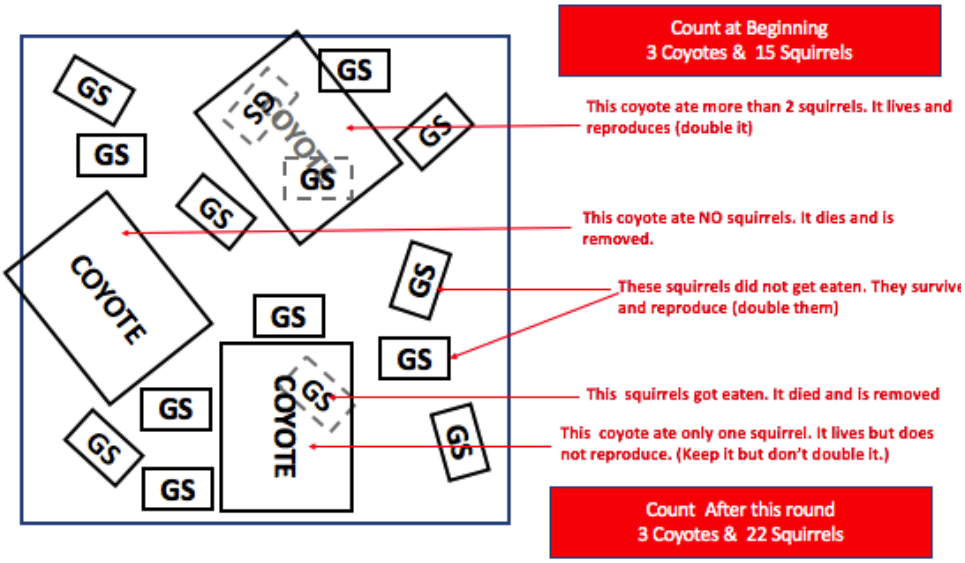
c) Pikas reproduce much faster than long-tailed weasels. The pika cards that **were not touched** by the long-tailed weasel cards **"escaped and survived to reproduce"**. So count them and then ***double their number*** for next round of the game (the next year). Record that number in the data table below.

d) The long-tailed weasel cards that **landed on only <u>one</u> pika** card have managed **"to eat & survive, but did NOT reproduce**". So that long-tailed weasel card should stay in the game for the next round of the game. (next year)

e) The long-tailed weasel cards that **land on <u>two or more</u> pika cards** have **"eaten very well and they get to reproduce".** Count them and double their number for the next round of the game (the next year).

f) **NOTE! IMPORTANT EXCEPTION:** If either the long-tailed weasels or the pikas are **<u>ALL</u>** gone (extinct), pretend as though they are not extinct and write "1" instead of "0" in your data table. This keeps the game from ending. In a real ecosystem, it is nearly impossible for long-tailed weasels to locate and eat all of the pikas.

10. **TO SUMMARIZE:** After dropping in the long-tailed weasels for each round, you will:
    a. First, remove the predator and prey cards that have "died". (following the rules above)
    b. Then, remove the predator and prey cards that have "survived." Double those that are allowed to reproduce according to the rules above.
    c. Finally, record the number of predator and prey in your data table. This represents one year in the ecosystem.
11. After you have counted and doubled as needed, scatter the prey cards into the area again and then toss the predator cards again as before. Repeat steps 5-8 for a total of 15 rounds (years).
12. After recording 15-20 rounds in the data table, graph your data. Use one color line for the long-tailed weasel data and a different color line for the pika data.


Count at Beginning
3 Coyotes & 15 Squirrels
This coyote ate more than 2 squirrels. It lives and reproduces (double it)
This coyote ate NO squirrels. It dies and is removed.
These squirrels did not get eaten. They survive and reproduce (double them)
This squirrels got eaten. It died and is removed
This coyote ate only one squirrel. It lives but does not reproduce. (Keep it but don't double it.)
Count After this round
3 Coyotes & 22 Squirrels
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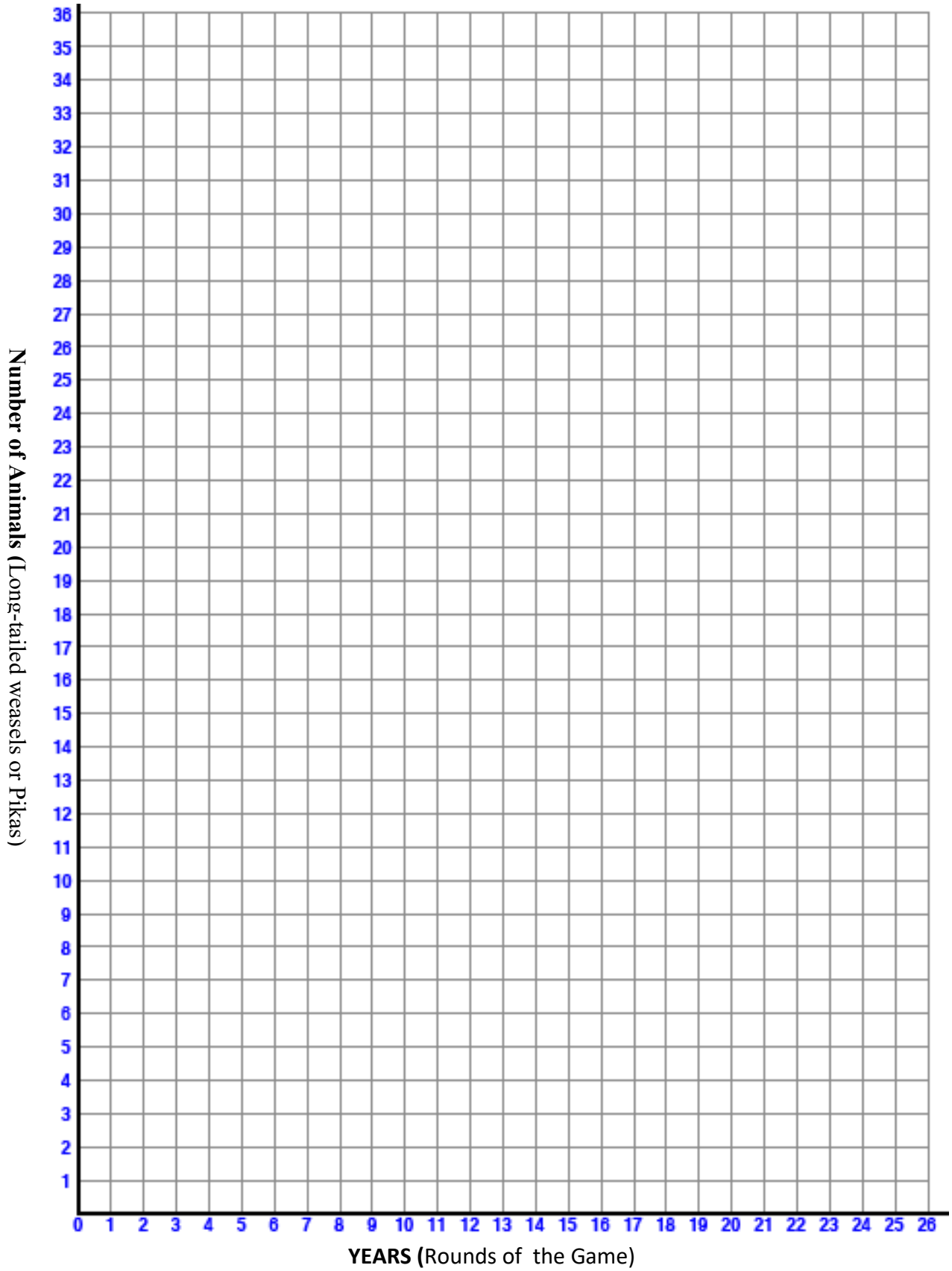
## DATA TABLE

| YEAR ( Round) | Long-tailed weasels | Pikas |
|---|---|---|
| 1 | 2 | 10 |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | | |
| 16 | | |
| 17 | | |
| 18 | | |
| 19 | | |
| 20 | | |

**GRAPH**

**( Let X= long-tailed weasel and * = pika )**



## ANALYSIS (What patterns do you see?) & INTERPRETATION (What does the pattern mean?)

**Directions:** Look at the graph and try to answer the questions.

1. Shortly after the **pika** population began to **increase**, the size of the **long-tailed weasel population**

   began to_____. This is probably because…..._____

   _____

2. Shortly after the **long-tailed weasel population** began to **increase**, the **pika** population began to

   _____. This is probably because…..._____

   _____

3. Shortly after the **pika** population began **decreasing**, the long-tailed weasel population began

   _____. This is probably because…..._____

   _____

4. Shortly after the **long-tailed weasel** population began **decreasing**, the **pika** population began

   _____. This is probably because…..._____

   _____

### *Answer questions 5 and 6 using complete sentences*

5. How does the predator population control the size of the prey population? (i.e., keep it from getting too big or too small.)

6. How does the prey population control the size of the predator population? (i.e., keep it from getting too big or too small.)

**Here is some sample data**

| Year (Round) | Long-tailed weasels (Start) | Pika (Start) | Long-tailed weasels not touching | Long-tailed weasels touching only 1 | Long-tailed weasels touching 2 or more | Pikas untouched | Pikas touched | Next Year Long-tailed weasel | Next Year Pika |
|---|---|---|---|---|---|---|---|---|---|
| **1** | 2 | 10 | | 1 | 1 | 7 | 3 | 3 | 14 |
| **2** | 3 | 14 | | 1 | 2 | 9 | 5 | 5 | 18 |
| **3** | 5 | 18 | | 2 | 3 | 12 | 6 | 8 | 24 |
| **4** | 8 | 24 | | 3 | 5 | 9 | 15 | 13 | 18 |
| **5** | 13 | 18 | 8 | 2 | 3 | 7 | 11 | 8 | 14 |
| | | | | | | | | | |

## Activity 2 –"Pikas & their Predators"

- **Activity Preparation-** 5-10 min
  - Before doing the activity:
    - Gather the required materials:
      - Chalk (or roll of painters tape or masking tapr)
      - Meter stick (or something straight that length)
      - Pencil or Pen (2 colors)
      - 50 Index cards
      - 20 Sheets of heavy construction paper (8.5"x11) (ror file folders or heavy paper or cardboard cut to size)

      (Note: Suggestions for household substitute materials are included on student activity guide)
    - If possible, print the activity. If a printer is not available, students can record their data and calculations on a blank piece of paper.

- **Student Considerations**
  - If possible, let students work in pairs, with another person, their age or older. (e.g. a sibling, parent etc. ). It's more fun that way. They can take turns handling the cards and recording the data. They can also check each other's counts for each round.
  - If that is not possible, it would be helpful if a parent or other adult could at least read the game rules and go through one round of the game with the student before turning them lose to model how it works in a gradual-release way.
  - If the student continues to struggle with understanding the rules and counting the cards, they can just graph the sample data provided at the end of their student activity sheet.
  - **Adaptations for Special Needs**: If students have learning disabilities, you might have them handle and count the "population" while a peer, parent or sibling reads directions and records data. If a student has poor fine motor control and is physically unable to perform the population counts, he or she could read and record the procedure aloud, and could present the results. You might use a tape recorder for results if writing is problematic. If a student is colorblind, be sure the two markers are not red and green.

## Sample Data & Graph:

**Here is some sample data (also provided to student on student activity sheet)**

| Year (Round) | Long-tailed weasels (Start) | Pika (Start) | Long-tailed weasels not touching | Long-tailed weasels touching only 1 | Long-tailed weasels touching 2 or more | Pikas untouched | Pikas touched | Next Year Long-tailed weasel | Next Year Pika |
|---|---|---|---|---|---|---|---|---|---|
| **1** | 2 | 10 | | 1 | 1 | 7 | 3 | 3 | 14 |
| **2** | 3 | 14 | | 1 | 2 | 9 | 5 | 5 | 18 |
| **3** | 5 | 18 | | 2 | 3 | 12 | 6 | 8 | 24 |
| **4** | 8 | 24 | | 3 | 5 | 9 | 15 | 13 | 18 |
| **5** | 13 | 18 | 8 | 2 | 3 | 7 | 11 | 8 | 14 |

(See sample graph on next page)