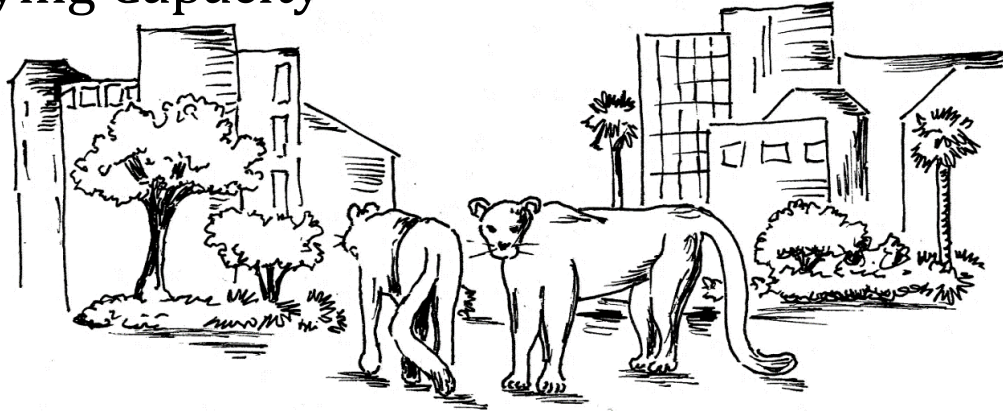




Lesson Four

Cat Carrying Capacity



Key Question

What factors affect the carrying capacity of the Florida panther?

Subjects

Science

Time Estimate

60-90 minutes

Key Vocabulary

Carrying capacity

Sunshine State Standards

Science

SC.7.N.1.1 Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.7.L.17.3 Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.



Objectives

In this activity, students will:

1. Discuss factors that might limit a species' population size in an area and develop hypotheses.
2. Play multiple rounds of panther population simulations as limiting factors to carrying capacity are manipulated
3. Record results and interpret the effects of limiting factors on carrying capacity



Materials

- Copies of food resource cards appropriate for the size of the class, cut out
- A copy of the Discussion Questions for each student
- A portable whiteboard or large paper to draw a chart
- Tape or rope
- Meter stick
- Cones or flags to delineate boundaries



Background

Carrying Capacity

Florida panthers roamed the entire Southeast United States long before Europeans settled here. They had a large, healthy population that was

limited in size by the amount food, water, space, and shelter found in their range. The region had a **carrying capacity**, or a number of panthers that the area could support. Through time, limiting factors caused panther populations to continuously fluctuate around the carrying capacity, sometimes going over and other times falling below. As more and more people settled in the area, the population of Florida panthers began to decline. Many people hunted them or shot them because they feared for their pets and livestock or simply disliked panthers.

At the same time, cities and roads were encroaching further and further into their habitat, shrinking the amount of space and thus also food and water and shelter available to panthers. All of these factors contributed to a large drop in the carrying capacity of Florida panthers.

The Florida panther was eventually pushed into the swamps and forests of South Florida, which was the only place remote enough to allow a few cats to escape humans. By 1970, panthers were believed to be extinct in Florida.

Beginning in the 1980s, conservation efforts, which later included a genetic restoration, brought panther numbers to over 100 by 2007. As of May 2020, the number of panthers in South Florida was estimated to be between 120 and 230. Their numbers may be leveling off, meaning that panthers are near carrying capacity given the available habitat remaining.

However, the habitat available to the Florida panther is still shrinking as development continues to encroach on the edges of their range. Additionally, as more people inhabit South Florida and more panthers roam, vehicular deaths continue to rise, killing more and more panthers each year.

The future of the Florida Panther will depend on protecting their habitat. In order to increase the carrying capacity, we will have to give them more space, more food, and fewer threats like vehicles.

Finite Food Supply

This game explores the concept of a finite food supply as one of the factors determining the carrying capacity of Florida panthers. Panthers feed primarily on deer and hogs, and often take smaller animals as well such as raccoons, armadillos, and rabbits. Panthers will occasionally eat alligators. To survive, an adult panther needs to consume about 1 deer or 1 hog per week. Panthers that consume smaller prey tend not to be as healthy as those consuming larger animals. A panther would have to consume at least 10 or more raccoons or armadillos per week to equal a small deer. Female panthers that are nursing kittens will need to eat about twice as much food as a single panther. The numbers used in this activity are based on this information.

Feline Leukemia

In addition to shrinking habitat, shrinking food supply, and increased road mortality, panthers face other threats. One possible danger that always lurks in South Florida is a disease known as feline leukemia. This disease spreads among feral cats and can sometimes infect Florida panthers. There have been a small handful of cases so far in panthers, and incidence of this disease could change in the future. It is deadly if contracted.

Advance Preparation

1. Find an open space outside or use an indoor or outdoor sports court. Use rope or cones to outline a large box (approx. 60 x 60 feet). This will represent the habitat available to the Florida panther. Have additional rope and cones ready for when
2. roads are added and the size of the habitat changes.
3. Prepare food cards by printing them and cutting them out. You should have approximately **2 deer, 1 hog, 1 raccoon, and 1 armadillo card per student**. You

can include 1-3 alligators in the game because panthers occasionally eat them. *Make sure to include the cards with an "L" printed on the bottom right corner in the game.* Spread the food out on the ground evenly throughout the 60 x 60 square.

4. Prepare to make a large chart with the results of the game so that all students can see it. Draw a chart using the one provided as a guide that you will fill out as the game is played.
5. Print out a discussion questions sheet for each student.

Procedure

1. Ask students to list factors that might limit the size of a population of Florida panthers or other organisms. Discuss the concept of carrying capacity and factors that influence it.
2. Explain to students that they are going to simulate a population of Florida panthers. Each student will be a panther and will try to gather the necessary resources to survive for 1 month. In order to survive for 1 month, students must collect 40 food points. They may obtain these with any combination of food cards.
3. **Play Round 1:** Ask students to stand on the edge of the square. When you say "GO", students will enter the square and begin gathering food. The round ends when all the food has been gathered. Students must now count how many food points they earned. If they did not gather 40 or more, they did not survive. Tally how many students survived, and record this number on the large chart. This represents the starting carrying capacity for Florida panthers. Spread all of the food cards back out over the square evenly.
4. **Play Round 2:** Explain to students that this round will proceed as the previous round, but a silent killer lurks. Ask students to stand on the edge of the square. When you say "GO", students will enter the square and begin gathering food. The round ends when all the food has been gathered. Students must now count how many food points they earned. If they did not gather 40 or more, they did not survive. If they did, now have students check to see if any of their food cards have an "L" on the bottom right corner. If so, this means they have contracted feline leukemia and will die as well. There was a small outbreak among panthers this year. Tally how many students survived, and record this number on the chart. Explain to students that for the remaining rounds, "L" will not mean anything and these food cards are safe to pick up. Spread the food cards back out over the square evenly.
5. **Play Round 3:** Before this round, add a road that cuts through the square using a rope. Explain that at any time, if the teacher says "FREEZE", students will have to stop where they are. The teacher (or a helper) will become a car and walk along the road through the square, holding a meter stick in front of him/her. If any student is touched by the stick, they will be hit by a car and will not survive. Ask all students to stand on the edge of the square (all panthers begin alive again each round). When you say "GO", students will begin gathering food. Say "FREEZE" before the food is gone and walk with the meter stick through the square. Panthers that are hit by the car will die and will move out of the square, keeping the food they gathered so far. Say "GO" again to resume food gathering and continue until food is gone. Tally the number of surviving panthers and record on the chart and
6. spread the food cards back out over the square evenly.
7. **Play Round 4:** Before this round, shrink the size of the square by moving the rope or cones inward by about 10 feet on each side.

Some of the food should now be located outside the square. Have students help you pick up food that is outside of the square and give it to you to stow away. The habitat is now smaller and less food is available as a consequence. Ask students to stand on the edge of square, say "GO" and let students begin gathering food. Say "FREEZE" before all the food is gone and walk the road with a meter stick, causing any panther that touches the meter stick to die and leave the round with their food. Resume the round by saying "GO", and when all the food is gone, tally the number of surviving panthers and record on the chart. Spread the food cards back out over the smaller square evenly (don't include the extra food from when the habitat was larger).

8. **Play Round 5:** Before the round, add a second road into the area with another piece of rope. Play the round like the others, including a "FREEZE" in the middle in which you drive BOTH roads as a car, causing any panther within the reach of the meter stick on either road to die. Tally the number of surviving panthers.
9. **Play Round 6:** Before this round, remove one of the roads and increase the area of the square by moving the cones or rope out by 5 feet on all sides. Add back in some, but not all, of the food you had stowed away from round 3. Highway underpasses were built under the road which is preventing panther deaths on that road, and a restoration project has provided new suitable habitat for panthers! Play the last round using the same rules, making sure to FREEZE and drive the road during the round. After all the food is gone, tally the number of surviving panthers and add it to the chart.
10. Discuss the results with students using the discussion questions page as a guide. If you'd like, have students break into partners and have discussions amongst themselves while they complete the worksheet.

Optional Extension

Have students develop ideas for additional rounds that can be played to experiment with how other factors might influence the carrying capacity of Florida panthers. For instance, some panthers will have kittens, causing them to require twice the food of a single panther. Some students could be panthers with kittens.

Cat Carrying Capacity

Food Resource Cards



Cat Carrying Capacity

Food Resource Cards



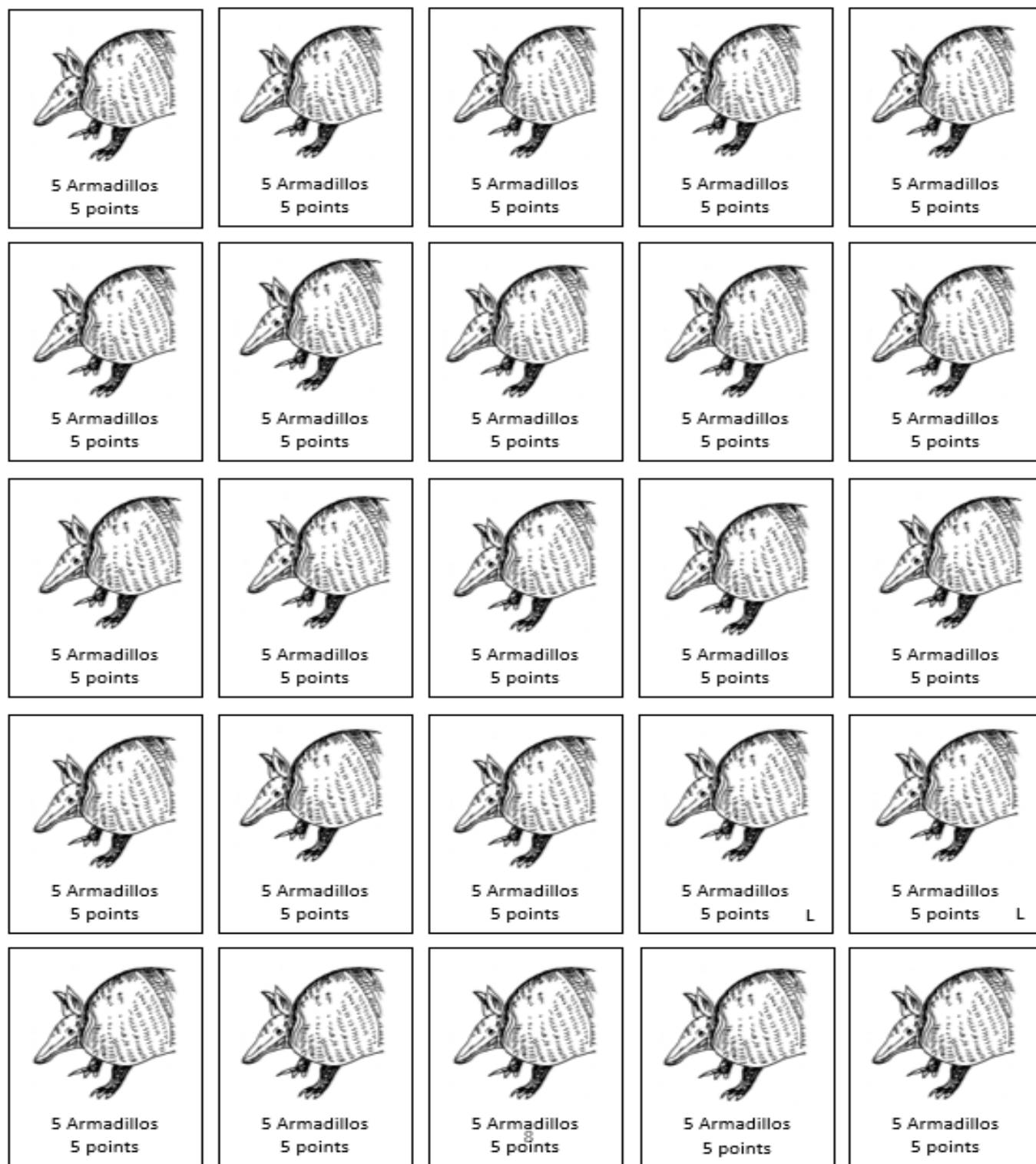
Cat Carrying Capacity

Food Resource Cards



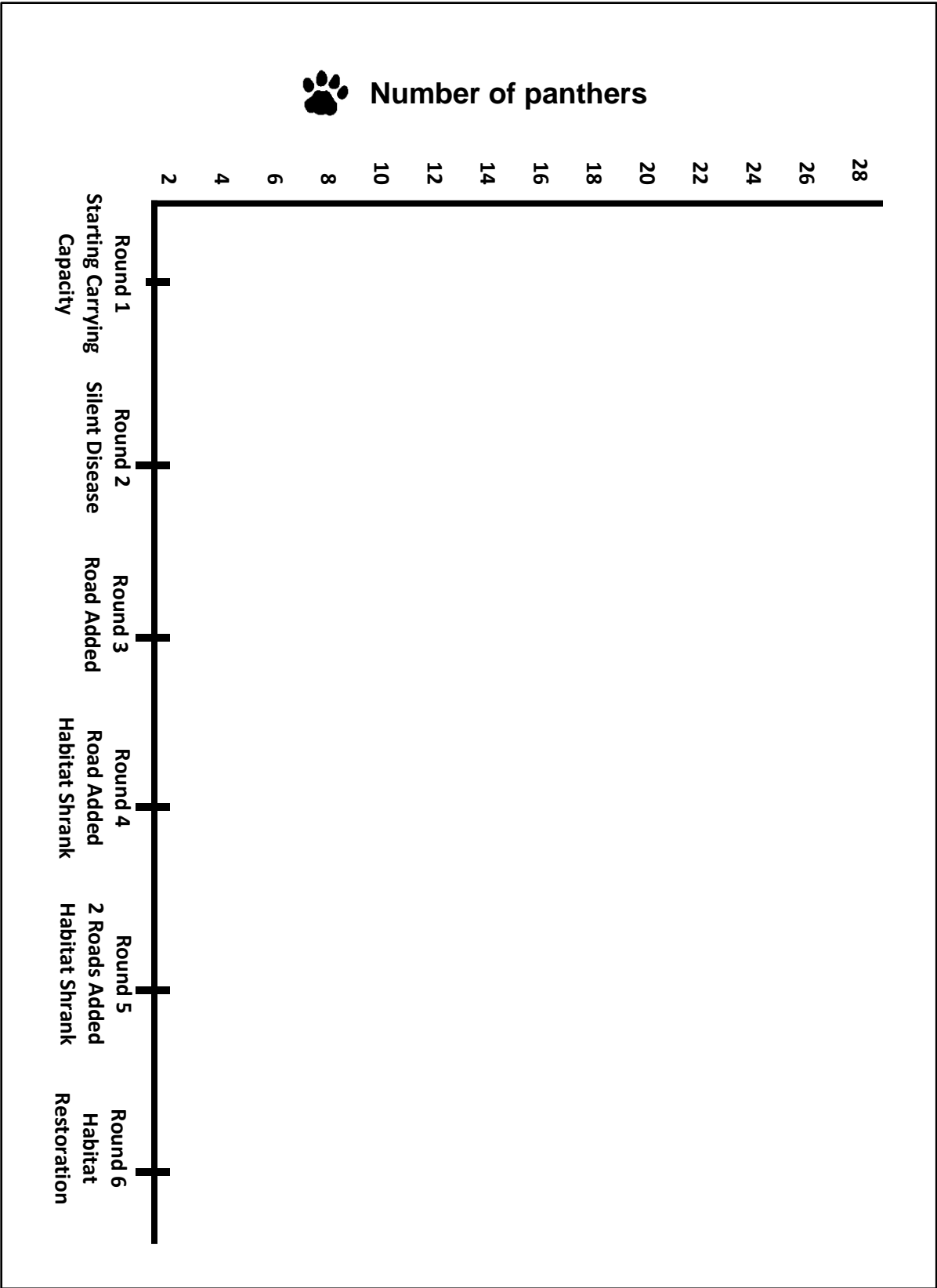
Cat Carrying Capacity

Food Resource Cards



Cat Carrying Capacity

Panther Population Chart



Cat Carrying Capacity

Discussion Questions

Your Name: _____



Directions: Using the results from the simulation game, answer the following questions.

1. Which limiting factors seem to have the largest effect on the panther population? Why?

2. Write at least 3 additional limiting factors that weren't used in the game affecting Florida panthers today:

3. In what specific ways might the introduction of the exotic species like the Burmese Python affect the carrying capacity of Florida panthers?

4. In what specific ways might a changing climate affect the carrying capacity of Florida panthers?

5. Name 3 things that could be done in South Florida to increase the carrying capacity of Florida panthers:
