The NASA SCI Files™

The Case of the Zany Animal Antics

Segment 2

While at NASA Kennedy Space Center (KSC), Catherine and Bianca stop by to see Mr. Mario Mota, a wildlife biologist who monitors the sea turtle population. Mr. Mota helps the tree house detectives understand animals' basic needs and the intricacy of the food chain. Just a few hours away, RJ is at an Adventure Camp at Busch Gardens Tampa where he meets Dr. D on the Serengeti Plain exhibit. While on "safari," Dr. D explains migration and the basic reasons animals migrate. After feeding Dolly, a female giraffe, RJ decides to see Ms. Kelly Diedring, a zookeeper at the park. Ms. Diedring explains mitosis and meiosis and the various ways that animals reproduce. Meanwhile, back at the tree house, the detectives have decided to put all their new knowledge to good use and help Kali with her Girl Scout badge. They also want to investigate building a wildlife preserve in Jacob's backyard. The detectives are not daunted by the challenges and continue their research.

Objectives

Students will

- summarize the basic needs of animals.
- understand the hierarchy of a food chain.
- describe how a food chain differs from a food web.
- learn how and why animals migrate.
- compare sexual and asexual reproduction.
- compare and contrast mitosis and meiosis.
- understand the importance of genetic diversity in a species.

Vocabulary

asexual reproduction—the production of offspring from one parent cell; reproduction without the fusion of male and female sex cells

carnivore—an animal that eats other animals

cell—the smallest independently functioning unit in the structure of an organism, usually consisting of one or more nuclei surrounded by cytoplasm and enclosed by a membrane

consumer—an organism that relies on other organisms for its energy and food supply

decomposer—an organism that breaks down and obtains energy from dead organic matter

food chain—series of steps in an ecosystem in which organisms transfer energy by eating and being eaten

food web—network of complex interactions formed by the feeding relationships among the various organisms in an ecosystem

genetics—scientific study of heredity

habitat—the natural conditions and environment in which a plant or animal lives

herbivore—an organism that obtains its energy by eating only plants

meiosis—a method of cell division in which sex cells are produced

migration—moving from one country, place, or locality to another; the movement of animals over the same route in the same season each year

mitosis—the process in which a cell's nucleus divides, forming two new cells with identical genetic material

omnivore—an organism that obtains energy by eating both plants and animals

producers—organisms that can capture energy from sunlight or chemicals and use it to produce food from inorganic compounds

reproduce—to produce offspring or new individuals through a sexual or asexual process

Serengeti Plain—an area of northern Tanzania bordering Kenya and Lake Victoria that is well known for its extensive wildlife preserve

sexual reproduction—the production of offspring by using sex cells

zygote—a fertilized egg

Video Component

Implementation Strategy

The NASA SCI Files™ is designed to enhance and enrich existing curriculum. Two to three days of class time are suggested for each segment to fully use video, resources, activities, and web site.

Before Viewing

1. Prior to viewing Segment 2 of *The Case of the Zany Animal Antics*, discuss the previous segment to review the problem and reaffirm what the tree house detectives have learned thus far. Download a copy of the **Problem Board** from the NASA SCI Files™ web site, select **Educators**, and click on the **Tools** section. The **Problem Board** is also in the **Problem-Solving Tools** section of the latest online investigation. Have students use it to sort the information learned so far.
2. Review the list of questions and issues that the students created prior to viewing Segment 1 and determine which, if any, were answered in the video or in the students' own research.
3. Revise and correct any misconceptions that may have been dispelled during Segment 1. Use tools located on the Web, as was previously mentioned in Segment 1.
4. Review the list of ideas and additional questions that were created after viewing Segment 1.
5. Read the Overview for Segment 2 and have students add any questions to their lists that will help them better understand the problem.
6. **Focus Questions**—Print the questions from the web site ahead of time for students to copy into their science journals. Encourage students to take notes while viewing the program to help them answer the

questions. An icon will appear when the answer is near.

7. **"What's Up?" Questions**—These questions at the end of the segment help students predict what actions the tree house detectives should take next in the investigation process and how the information learned will affect the case. They can be printed from the web site ahead of time for students to copy into their science journals.

View Segment 2 of the Video

For optimal educational benefit, view *The Case of the Zany Animal Antics* in 15-minute segments and not in its entirety. If you are viewing a taped copy of the program, you may want to stop the video when the Focus Question icon appears to allow students time to answer the question.

After Viewing

1. Have students reflect on the "What's Up?" Questions asked at the end of the segment.

Careers
animal trainer
behaviorist
geneticist

2. Discuss the Focus Questions.
3. Have students work in small groups or as a class to discuss and list what new information they have learned about animals' basic needs, habitats, migration patterns, and reproduction.
4. Organize the information and determine whether any of the students' questions from the previous segments were answered.
5. Decide what additional information is needed for the tree house detectives to build a healthy backyard habitat. Have students conduct independent research or provide students with information as needed. Visit the NASA SCI Files™ web site for an additional list of resources for both students and educators.
6. Choose activities from the **Educator Guide** and web site to reinforce concepts discussed in the segment. Pinpoint areas in your curriculum that may need to be reinforced and use activities to aid student understanding in those areas.
7. For related activities from previous programs, download the **Educator Guide**. On the NASA SCI Files™ home page, select **Educators**. Click on **Episodes** in the menu bar at the top. Scroll down to the 2002–2003 Season and click on *The Case of the Inhabitable Habitat*. In the green box, click on **Download the Educator Guide**.

   a. In the **Educator Guide** you will find

   b. **Segment 1** – *Biomes, Welcome to My Habitat, Don't Burst My Bubble, and How Does Your Garden Grow*

   c. **Segment 2**—*How Are We Related? A Community Connected, Chain Reaction, and Sprouts To Grow*

   d. **Segment 4**—*Where Have All the Turtles Gone? Fishing for Fish, and Bloomin' Algae*

   Close the PDF window and return to the Educators page. Click on **Episodes** in the menu bar at the top. Scroll down to the 2002–2003 Season and click on *The Case of the Biological Biosphere*. In the green box, click on **Download the Educator Guide.**

   a. In the **Educator Guide** you will find

      a. **Segment 2** – *Going Cellular*

      b. **Segment 4** – *Biologically Speaking*

   Close the PDF window and return to the Educators page. Click on **Episodes** in the menu bar at the top. Scroll down to the 2003–2004 Season and click on *The Case of the Prize-Winning Plants*. In the green box, click on **Download the Educator Guide**.

   b. In the **Educator Guide** you will find

      a. **Segment 4** – *Teenage-Mutant Corn?*
8. If time did not permit you to begin the web activity at the conclusion of Segment 1, refer to number 6 under **After Viewing** on page 15 and begin the Problem-Based Learning activity on the NASA SCI Files™ web site. If the web activity was begun, monitor students as they research within their selected roles, review criteria as needed, and encourage the use of the following portions of the online, Problem-Based Learning activity:

   Research Rack—books, Internet sites, and research tools

   Problem-Solving Tools—tools and strategies to help guide the problem-solving process

   Dr. D's Lab—interactive activities and simulations

   Media Zone—interviews with experts from this segment

   Expert's Corner—listing of Ask-An-Expert sites and biographies of experts featured in the broadcast
9. Have students write in their journals what they have learned from this segment and from their own experimentation and research. If needed, give students specific questions to reflect upon as suggested on the **PBL Facilitator Prompting Questions** instructional tool found by selecting **Educators** on the web site.
10. Continue to assess the students' learning, as appropriate, by using their journal writings, problem logs, scientific investigation logs, and other tools that can be found on the web site. For more assessment ideas and tools, go to **Educators** and click on **Instructional Tools** in the menu bar.

Resources *(additional resources located on web site)*

Books

Bash, Barbara: *Urban Roosts: Where Birds Nest in the City*. Little, Brown, and Company, 1992, ISBN: 0316083127.

Capeci, Anne: *Food Chain Frenzy.* Scholastic, 2004, ISBN: 0439560500.

Cherry, Lynne: *Flute's Journey.* Harcourt, 1997, ISBN: 0152928537.

Chinery, Michael: *Predators and Prey.* Crabtree Publishing, 2000, ISBN: 0778702278.

Cole, Joanna: *Magic School Bus Goes Upstream: A Book about Salmon Migration.* Sagebrush Education Resources, 1997, ISBN: 0613027388.

Durand, Stephane: *Winged Migration: The Junior Edition.* Editions du Seuil, 2004, ISBN: 2020633493.

Hammerslough, Jane: *Owl Puke: Book and Owl Pellet.* Workman, 2004, ISBN: 0761131868.

Kalman, Bobbie: *What Are Food Chains and Webs?* Crabtree Publishing, 1998, ISBN: 0865058881.

Kalman, Bobbie: *What Is a Life Cycle?* Crabtree Publishing Company, 1998, ISBN: 0865058865.

Kalman, Bobbie: *The Life Cycle of a Sea Turtle.* Crabtree Publishing Company, 2001, ISBN: 0778706826. (Note: This author has completed an extensive collection of life cycle books including earthworm, honeybee, seahorse, bird, snake, whale, wolf, and spider.)

Knight, Tim: *Incredible Life Cycle.* Heinemann Library, 2003, ISBN: 1403411484.

McDonnell, Janet: *Animal Migration.* Child's World, Inc., 1997, ISBN: 1567664024.

Phinney, Margaret Yatsevitch: *Exploring Underground Habitats.* Mondo Publishing, 1999, ISBN: 1572551615.

Riha, Susanna: *Animal Journeys: Life Cycles and Migrations.* Blackbirch Press, 1999, ISBN: 1567114261.

Video

Disney Channel: *Food Web (Bill Nye the Science Guy)*
Grades 3–8

Disney Channel: *Life Cycles (Bill Nye the Science Guy)*
Grades 3–8

Schlessinger Media: *Animal Life for Children: All About Animal Life Cycles*
Grades K–4

Schlessinger Media: *Animal Life for Children: All About Food Chains*
Grades K–4

Web Sites

NASA Imagers: The Adventures of Amelia the Pigeon
This NASA web site teaches children about habitats and offers an interactive web site with a multimedia adventure game and web activities.
http://imagers.gsfc.nasa.gov/amelia/index.html

Busch Gardens® Tampa Bay
Visit this site to learn about the unique educational opportunities and resources available for teachers and students, with free downloads of educator guides on such topics as "Arctic Animals" and "Diversity of Life." Explore various careers and learn more about Busch Gardens® Adventure Camps.
http://www.buschgardens.com/buschgardens/fla/educational_resources.aspx

Animal Homes
Click and drag the animals to their appropriate habitat in this interactive animal homes game.
http://games.funschool.com/game.php?g=ank_ds2,f&8&54

National Geographic Kids—The Fantastic Forest
In this interactive virtual forest, you'll encounter a variety of habitats—places perfectly suited for particular plants and animals that are important parts of the forest and our environment.
http://www.nationalgeographic.com/forest/index.html

Africam
Visit Africam, the world's first virtual game reserve to see the live web cams set up at game reserves across the world. You can see the various habitats animals live in.
http://www.africam.com/

Animal Migration
Visit the Franklin Institute's web site to learn about the migratory patterns of birds, butterflies, whales, and many other animals.
http://sln.fi.edu/qa96/spotlight4/spotlight4.html

US Geological Survey—Children's Butterfly Site
Learn about the life cycle of a butterfly on this US Geological Survey web site. There are coloring pages, pictures, links to other web sites, and a frequently asked questions area.
http://www.mesc.usgs.gov/resources/education/butterfly/bfly_intro.asp

The Circle of Life: Life Cycles
Visit this web site to learn about the life cycles of frogs, dogs, butterflies, fish, turtles, chickens, grasshoppers, and plants. There are also fun games to play after you have learned some of the life cycles.
http://www.promotega.org/vsu30015/

Ecosystems, Biomes, and Habitats
The Franklin Institute's web site has a wide variety of information on animal habitats and biomes.
http://www.fi.edu/tfi/units/life/habitat/habitat.html

Living and Non-Living Things
This Open Door Web Site provides information on the differences between living and non-living things.
http://www.saburchill.com/chapters/chap0001.html

Marshmallow Meiosis
Explore genetics by raising reebops in the classroom. Reebops are imaginary organisms that are prolific and require minimal care. Made from marshmallows and other everyday common household items, they are a fun-filled way to teach meiosis.
http://www.iloveteaching.com/writesci/Rebops/

Activities and Worksheets

Just the Basics

Segment 2

Purpose

To identify and describe four essential components of a healthy habitat

Materials

duct tape or string
large, open area (outside is best)
Data Sheet (p. 42)

Teacher Prep

1. Using tape or string, mark off two 15-meter parallel lines on the floor or playground that are about 10–20 meters apart.
2. Have students count off in fours.
3. Discuss the basic needs of animals with the students and do steps 1 and 2 prior to playing the game.

Procedure

1. In your group, discuss what animals need to survive and without which they would die. Consider what you need each day to survive.
2. Reach a consensus of the four most important things for survival and write your prediction below:
   a. _____ is an essential habitat component for animals to survive.
   b. _____ is an essential habitat component for animals to survive.
   c. _____ is an essential habitat component for animals to survive.
   d. _____ is an essential habitat component for animals to survive.

Game

1. To play the game, the students who are number 1 are deer and will stand behind one line.
2. All other students (2, 3, and 4) will stand behind the other line.
3. Use the following signals
   a. food: place hands over stomach
   b. water: place hands over mouth
   c. shelter: clasp hands over head
   d. space: hold arms straight out
4. Both groups should stand in a straight line next to their designated lines on the ground with their backs to the other group. See diagram 1.

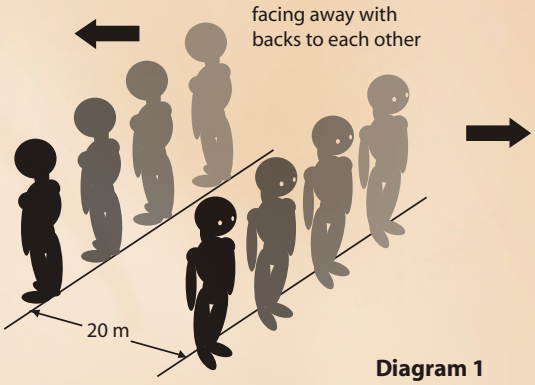

Diagram 1

5. When the teacher or leader indicates that the game is about to begin, everyone chooses an essential habitat component (food, water, shelter, or space) and displays that signal as indicated in step 3.
6. When the teacher or leader counts to three, turn and face the other group.
7. The "deer" will run to find and capture a student on the other side that has signaled the same habitat component that they did. For example, if a deer chooses food by placing his hands over his stomach, he would need to capture a person on the other side that also chose food.
8. If a deer captures the needed habitat component, they both return to the deer's side of the line. The deer has now successfully reproduced, and a new deer has been added to the group.
9. Any deer that fails to find the habitat component it was seeking dies and becomes part of the habitat, joining the students on the habitat side.

Just the Basics

Segment 2

10. Count the number of deer remaining after the first round and record it in the data sheet.
11. Count the number of habitat components remaining and record in the data sheet.
12. Continue playing the game for 14 more rounds.
13. Using the recorded data, create a graph showing the number of deer after each round.
14. Create a graph showing the number of habitat components after each round.
15. Compare the two graphs. Note: To more easily compare the two graphs, you can create one graph using one color to represent deer and another color to represent habitat components.

Conclusion

1. What are the basic needs of animals?
2. Explain what happened as the game progressed.
3. What are some factors that could limit a population?
4. How do human beings limit a population's growth?

Extension

Play the game again but introduce limiting factors that would deplete the habitat components. Graph the results and compare. There have to be at least two deer left or the deer are extinct.

Just the Basics

Segment 2

DATA SHEET

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Deer															
Habitat Components															

KEY

"Vore"-acious Eaters*

Segment 2

Purpose

To identify how to meet the need for water and food in an environment

To use data to determine if an animal can survive in an environment

To describe the food needs of carnivores, herbivores, and omnivores

Background

Organisms' needs must be met for them to survive in a specific environment. Organisms need food, water, shelter, and space.

One way that animals are grouped is by the food they eat. Carnivores eat only meat, herbivores eat only plants, and omnivores eat both meat and plants.

Teacher Prep

1. Using card stock, make enough copies of the Animal Needs Cards (p. 45) so that each student receives one. Cut apart the cards and laminate them if desired. Note: Cards are to be passed out to the students after they have graphed their results.
2. Shortly before beginning this activity, distribute the multicolored cereal loops over a large area (outdoors works best) that is free from objects that students might trip over.

Materials

per Class
box of multicolored loop cereal
Animal Needs Cards (p. 45)
timer or watch
large, open area (outside is best)

Per Student
small piece of clay
6 long coffee stirrers
colored pencils or crayons
small lunch bag
Graphing Sheet (p. 46)

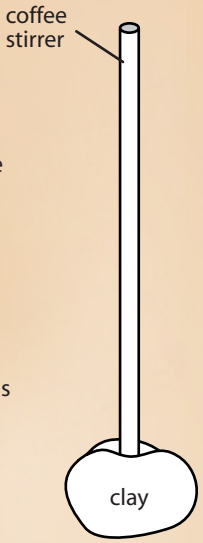

Diagram 1

Procedure

1. Make a list of all the foods you ate for your last meal.
2. Classify each type of food as either coming from a plant or animal. Some foods, such as a pizza, might be classified as both.
3. Determine whether you are an omnivore, herbivore, or carnivore based on your last meal.
4. Make a list of the reasons why these foods are important to your survival.
5. Discuss your rationale with your group or class.
6. When it's time to play the game, take the lunch bag and go to the area designated by your teacher.
7. When the teacher gives the signal to begin, you will have three minutes to collect as many cereal loops as you can and place them in the lunch bag.
8. When the teacher gives the signal to stop, return to the classroom.
9. Divide the small piece of clay into six equal parts and roll each into a ball.
10. Insert a coffee stirrer into each ball of clay. See diagram 1.
11. Place the balls of clay with the stirrers onto the Graphing Sheet at the bottom. Place one ball with stirrer on top of each letter.
12. Note the letter and the color it represents: R—red, O—orange, Y—yellow, G—green, B—blue, and P—purple.
13. To create a three-dimensional bar graph, sort the multicolored cereal loops by placing each loop on the correct stirrer designated for that color.
14. On the left side of the Graphing Sheet, record the increments by numbering the lines (0, 1, 2…) from the bottom upward.
15. Record the results from your three-dimensional bar graph onto the Graphing Sheet.
16. When your teacher gives you an Animal Needs Card, read the criteria given and determine whether your water and food needs were met. If so, you survived!

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"Vore"-acious Eaters*

Segment 2

Conclusions

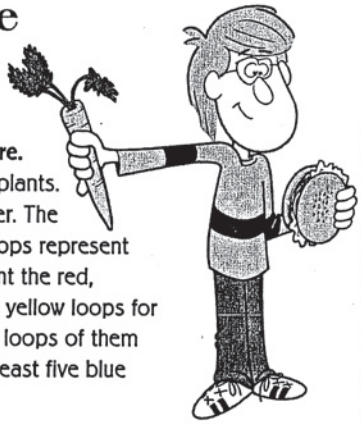
1. What are the two needs that this activity helped you understand organisms must have to survive?
2. Is it important that all animals survive in an environment? Why or why not?
3. Which type of animal (omnivore, carnivore, or herbivore) had the best chance of surviving? Why?
4. What types of food were represented by the orange, red, green, and yellow loops?
5. Were you able to use all your loops for food? Why or why not?
6. Would too much food in an environment be a problem? Explain.

"Vore"-acious Eaters*

Animal Needs Cards

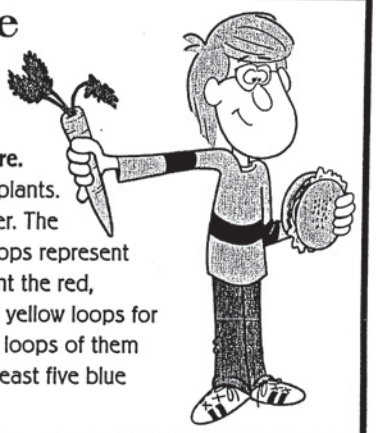
"Vore"-acious Eaters Animal Needs Cards

Omnivore



You are an **omnivore.** You eat meat and plants. You also need water. The purple and blue loops represent water. You can count the red, orange, green, and yellow loops for food. You need 20 loops of them to survive, plus at least five blue and purple loops.

Omnivore



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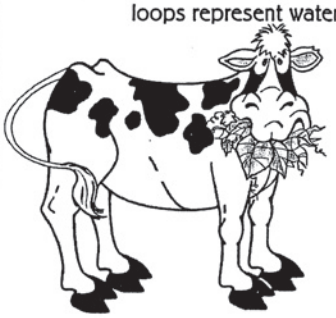
Herbivore

You are an **herbivore.** You only eat plants. You also need water. The purple and blue loops represent water. The only loops you can count for food are the green- and yellow-colored loops. To survive, you need 20 green and yellow loops and an even number of blue and purple loops.



Herbivore

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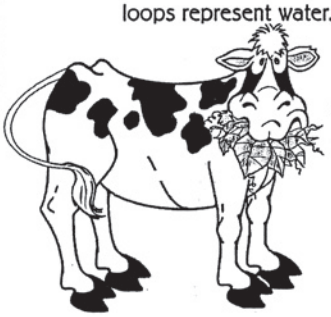
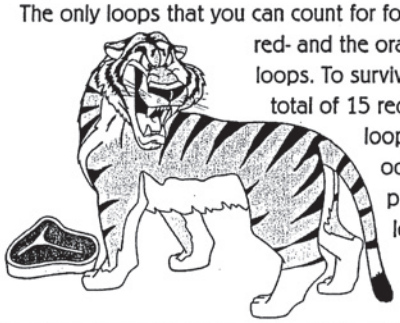


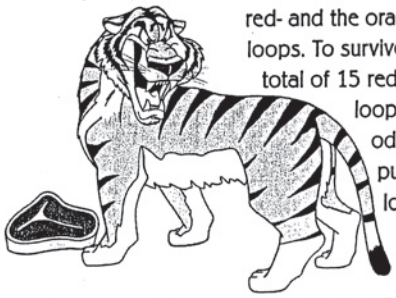
Carnivore

You are a **carnivore.** You only eat meat. You also need water. The purple and blue loops represent water. The only loops that you can count for food are the red- and the orange-colored loops. To survive, you need a total of 15 red and orange loops and an odd number of purple and blue loops.



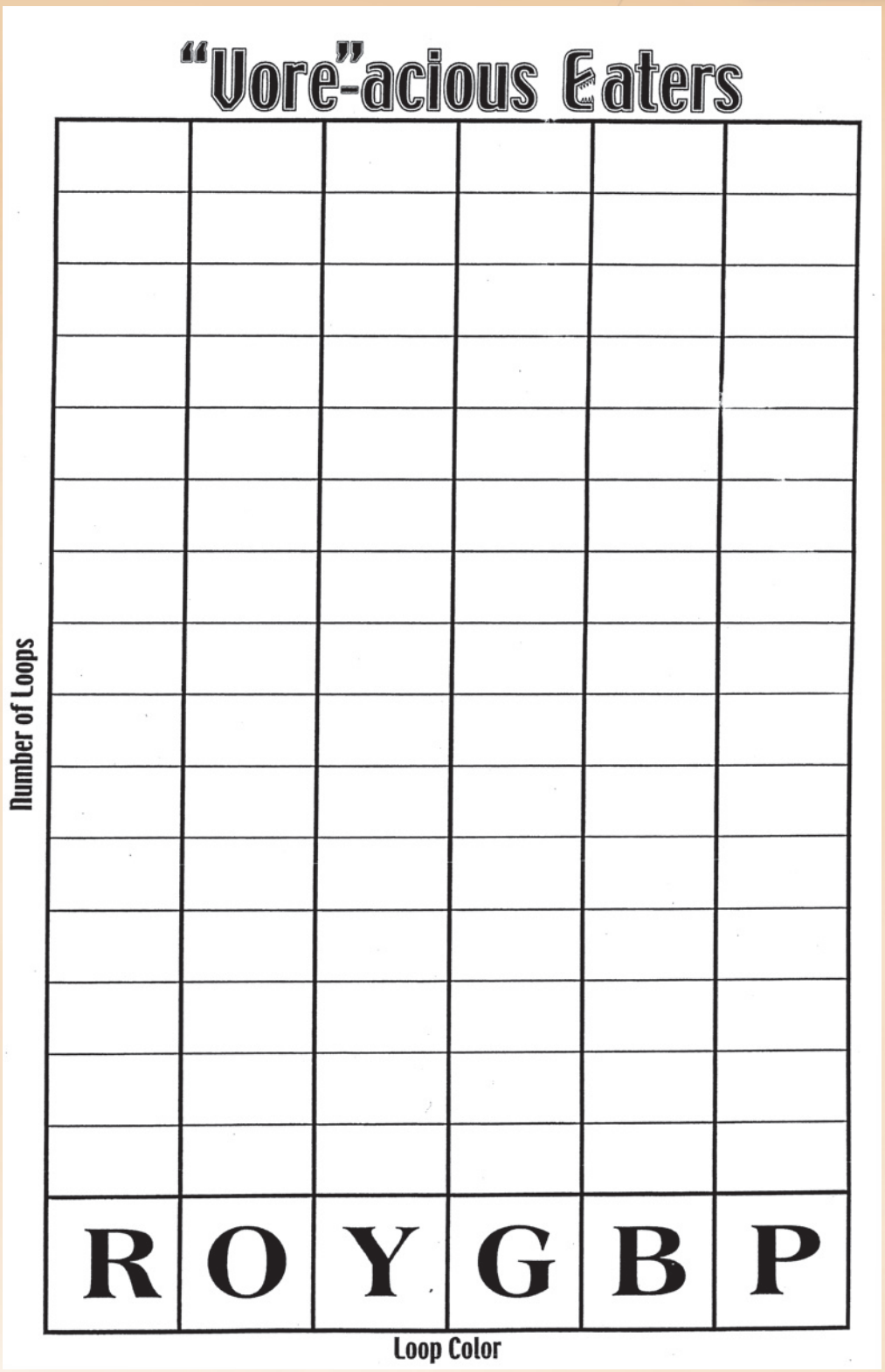
Carnivore

You are a **carnivore.** You only eat meat. You also need water. The purple and blue loops represent water. The only loops that you can count for food are the red- and the orange-colored loops. To survive, you need a total of 15 red and orange loops and an odd number of purple and blue loops.



"Vore"-acious Eaters*

Graphing Sheet



Chain Games*

Segment 2

Purpose

To learn that plants are the main source of energy entering most food chains

Background

Food chains exist in all habitats and can be used to demonstrate the complexity and energy flow in an ecosystem. Producers capture the Sun's energy to make their own food in plant form, while consumers rely on other consumers or on eating those plants to get their energy. When an animal eats a plant, it only receives 10% of the energy that the plant got from Sun. Likewise, when an animal eats another animal, it only receives 10% of the energy the animal got from the plants or other things it ate. This 90% energy loss at each level of a food chain is the reason there are so many low-level (primary) consumers and so few top-level consumers.

Materials

- labels
- Chain Game Cards (p. 50)
- Food Chain Key (p. 51)
- scissors
- wadded ball of paper (energy)

Teacher Prep

1. Make enough copies of the Chain Game Cards (p. 49-50) for each group of four students to have a set.
2. Make a set of labels for each group of four on paper or index cards that say Sun, Grass, Deer, Wolf.
3. Make a ball of wadded paper (four pieces of paper per ball) for each group by wadding one piece of paper and then wadding another piece over the first ball until you have created four layers.

Procedure Part 1

1. In a small group of four, discuss the tasks that you have done today. Did you complete a math assignment, run on the playground, sing a song, or just breathe?
2. Discuss and make a list of where you found the energy to accomplish these tasks.
3. Look at the ball of wadded paper. This ball represents energy.
4. Lay face down the four labels that say Sun, Grass, Deer, and Wolf.
5. Have each member of the group choose one label.
6. The Sun holds the ball of energy and begins the game by passing it to Grass.
7. Grass removes one layer of paper from the ball. What does removing the paper represent?
8. Grass passes the ball to Deer.
9. Deer removes one piece of paper and passes it to Wolf.
10. Wolf removes one piece of paper. What is left?
11. Explain what happens to the energy as it moves along the food chain.

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Chain Games*

Segment 2

Procedure Part 2

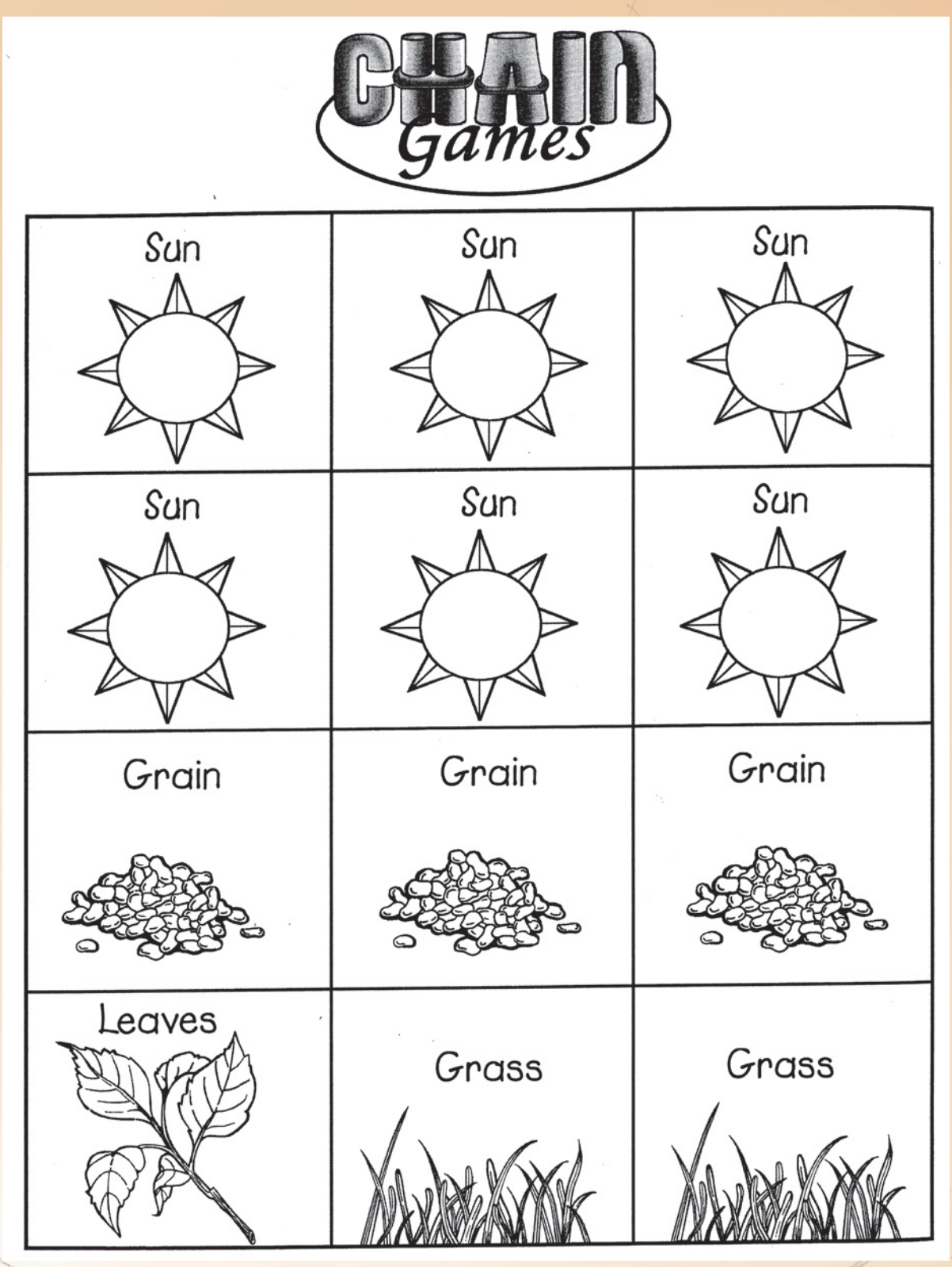
1. Using scissors, cut apart the Chain Game cards.
2. Shuffle the cards and lay them face down in ordered rows and columns.
3. Determine which player will go first (youngest).
4. The first player will turn over two cards face up.
   a. If either of these cards begins or continues a food chain, the player takes the card(s). For example, if a player turns over a Sun, he/she will take that card because the Sun is at the beginning of a food chain.
   b. All food chains must begin with the Sun, followed by a producer.
   c. If the player can use only one of the two cards, the unusable card is turned face down in the same location from which it was taken.
   d. If a player can use both cards, he/she continues to turn cards over, one at a time until a card that he/she cannot use is turned over. The unusable card is replaced face down.
5. The player to the left of the first player now takes his/her turn and the game continues by repeating steps 4 and 5.
6. Players may have multiple food chains going at the same time.
7. The game ends when there are no more food chains that can be created with the remaining cards.
8. Use the Food Chain Key to verify that food chains have been correctly linked.

Conclusion

1. Could plants ever be anywhere in the food chain except at the beginning? Explain.
2. Could animals ever be at the beginning of a food chain? Why or why not?
3. What is the source of all energy?

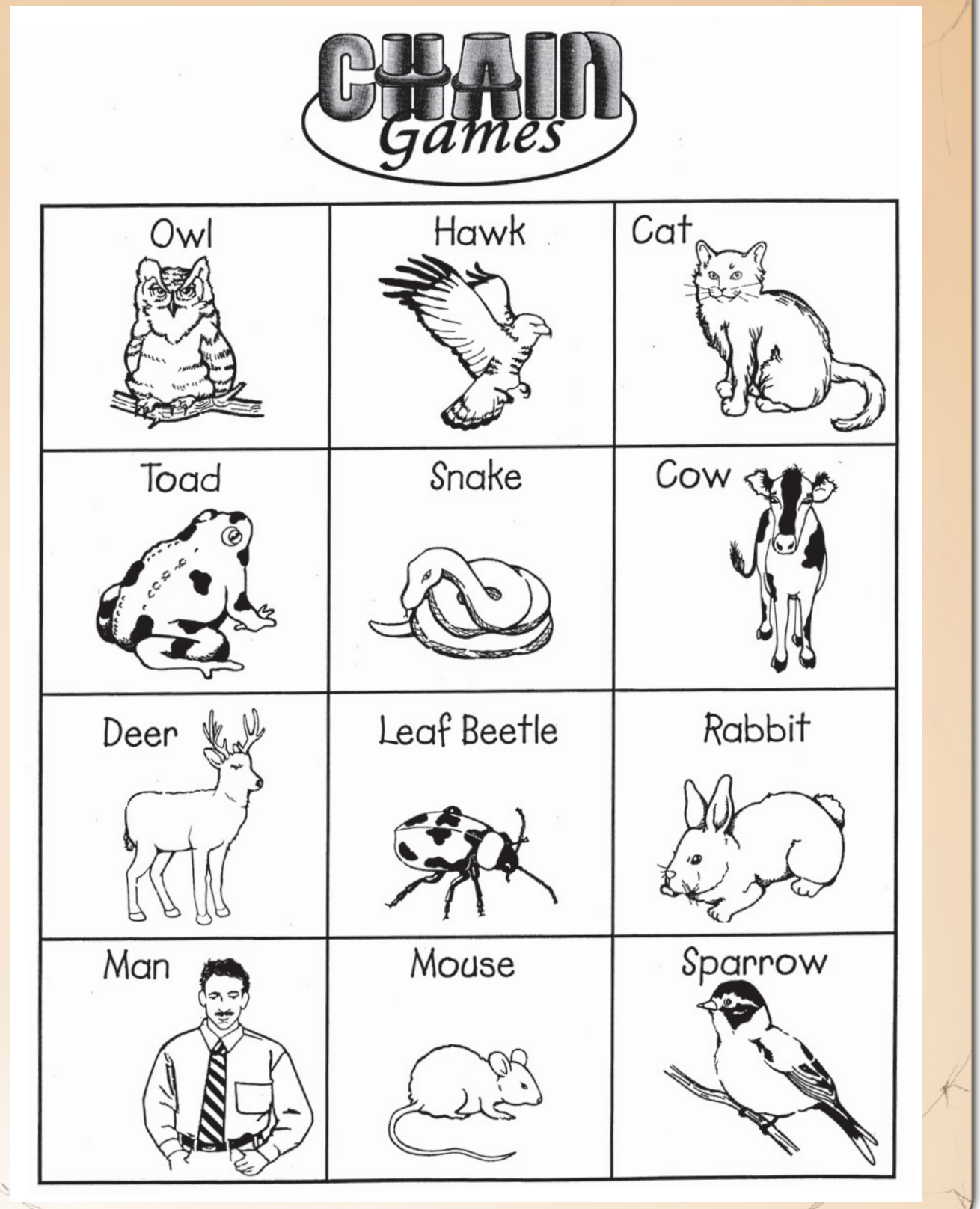
Chain Games*

Chain Game Cards



Chain Games*

Chain Game Cards



Chain Games*

Food Chain Key

CHAIN Games

Food Chain Key

Owl 	**What it eats:** Frog Sparrow Snake Mouse	Hawk 	**What it eats:** Snake Sparrow Mouse Frog Rabbit	Cat 	**What it eats:** Frog Snake Sparrow Rabbit Mouse
Toad 	**What it eats:** Leaf beetle	Snake 	**What it eats:** Frog Mouse	Cow 	**What it eats:** Grain Grass
Deer 	**What it eats:** Grain Leaves Grass	Leaf Beetle 	**What it eats:** Leaves	Rabbit 	**What it eats:** Grain Grass Leaves
Man 	**What it eats:** Cow Rabbit Deer Grain	Mouse 	**What it eats:** Grain	Sparrow 	**What it eats:** Grain Leaf beetle

Misdirected Migrations

Segment 2

Purpose

To understand how animals migrate and factors that affect their migration

Background

Migration is the movement of animals over the same route in the same season each year. There are several reasons that animals migrate. In the northern and southern hemispheres, there are several months each year when the areas are covered by snow and ice. In such harsh conditions, plant growth decreases, making it difficult for animals to find food. Some animals will travel from the winter place where food is scarce to a warmer place where food is more plentiful. Some animals will stay behind and make the best of the situation, while others will become dormant or inactive to save energy.

In other parts of the world, such as Africa, springbok, wildebeests, zebras, and other large African mammals travel long distances from dry areas to wet regions where new plants are growing. These journeys are often less predictable than seasonal north-south migrations, but they involve some of he largest mass movements of animals on Earth.

Some ocean mammals, such as right whales and fur seals, migrate to find warmer water, locate food, and give birth to their young. Fish usually migrate to breed.

There are many factors that ensure the success of migration. For example, birds need ponds, lakes, and marshes to provide food and shelter as they travel. Without these areas, such as wetlands, birds would not have the energy to make the long journey. At the time our country was first settled in the 1600s there were 215 million acres of wetlands. Today there are less than 100 million acres.

Teacher Prep

1. Use chalk or duct tape to create a large hopscotch course, as depicted in diagram 1, page 53.
2. Reduce the number of squares by one after all students complete the course. Reduce them in this order: square 3, square 5, square 7, square 6, square 8.

Procedure

1. You are a bird trying to migrate from Florida to Maine. Each square represents a wetland where you stop along your journey to rest, get food, and find shelter.
2. Start in squares 1 and 2 and complete the hopscotch course.
3. After all students have completed the course, discuss how difficult it was to complete.
4. Unfortunately, an area of wetland along your route has been destroyed due to a new building addition to the community. Note: Teacher will mark off square 3.
5. Complete the hopscotch course, not using square 3.
6. Repeat step 3.
7. Areas continue to be destroyed each year you make the journey. Repeat steps 4–6 until all designated areas are destroyed.
8. In your science journal, write about the experience and describe when you failed to make the migration.

Misdirected Migrations

Segment 2

Conclusion

1. Explain why some birds died earlier than others.
2. Why did all the birds eventually die even though some wetlands remained?
3. Is it important to save wetlands? Why or why not?
4. It is often necessary to develop new areas for business, subdivisions, and industry as communities grow. What could be done to balance growth with preserving our wetlands and other vital habitats?

Extension

1. Investigate your community and local areas to see whether there are any threatened wetlands.
2. Use field guides or other resources to find any birds that migrate to and from your community.
3. Research the migration patterns of the animals on the Serengeti Plain. Use a map of Africa to show the patterns of their migrations.
4. Research ocean marine animals and draw their migration patterns on a world map.

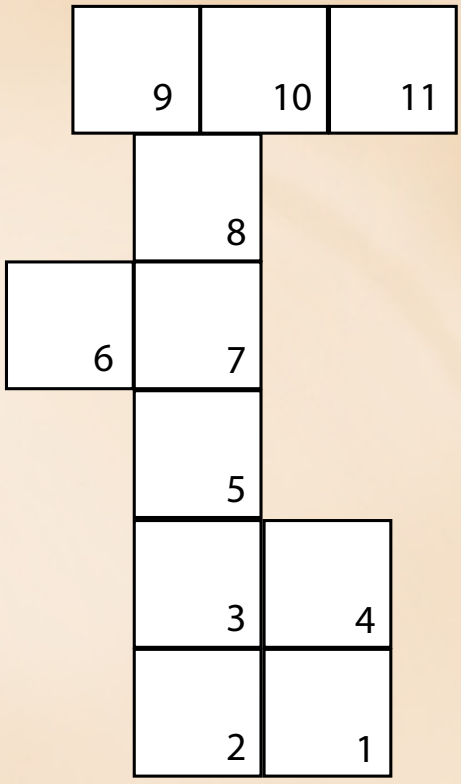


Diagram 1

Answer Key

Segment 1

Just the Basics

1. Food, water, shelter, and space.
2. The herd grows in the beginning, then some die as the habitat is depleted. This fluctuation is a natural process unless factors, which limit the population, become excessive.
3. Answers will vary but might include drought, fires, deforestation, industrial development, storms, and uncontrolled hunting.
4. Human beings develop areas for housing and industry. Each time an area is developed with buildings, streets, and other factors, there is less area of usable habitat for the animals that live there.

"Vore"-acious Eaters

1. Food and water.
2. No, the environment would eventually become overpopulated and there would not be enough resources to meet their needs.
3. Omnivores would have the best chance to survive because by eating both plants and animals, they have many more options for food.
4. Orange and red represented meat and yellow and green represented plants.
5. Answers will vary, but most students who were herbivores and carnivores would not have been able to use all cereal loops. If a student was a carnivore and got yellow and green loops (plants), he/she would not have been able to use them. It would be just the opposite for an herbivore.
6. Answers will vary, but too much food might pose a problem. Animals might have the tendency to overeat, which might cause problems with their ability to run fast and escape predators. Too much food might also create a population explosion and overcrowd the environment.

Chain Game

1. No, because they make their own food, they can only get their energy directly from the Sun.
2. No, animals are not able to make their own food, so they have to get their energy by eating a plant or other animal.
3. The Sun is the source of all energy.

Misdirected Migrations

1. Answers will vary but might include that some birds may have died earlier than others because they were not as strong as the others (unable to hop as far).
2. All the birds eventually died because there were not enough wetlands left to provide food, shelter, and water along their journey. Even though some wetland areas were left, their locations did not help them during their journey. The birds would have had to fly too long to get there and would not have had enough energy for such a long distance.
3. Answers will vary.
4. Answers will vary, but might include that studies should be done to make sure that an area is not a wetland or an endangered species habitat, and alternate locations might be considered.