



# Montclair State University

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## Wildlife Challenge

**Subject Area:** Natural Science, Large-Group Summative

**Core Curriculum Content Standards:** 2.5AC&D, 3.3A, 3.4A, 3.5A, 4.1A, 4.4A, 5.3D, 5.5A&B, 5.10A&B, 6.6E

### Session Description

The Wildlife Challenge involves children in active simulation games. Groups of 20-30 students rotate through three or more games in which they roleplay specific animals or other living organisms struggling to survive. A brief discussion after each game allows students to rediscover concepts touched upon in other SOC sessions such as limiting factors, population dynamics, biodiversity, and habitat conservation. *All games are adapted from Project Wet, Wild, Aquatic Wild, and Learning Tree.*

### Objectives

1. Given a challenge and a set of rules, students will roleplay wildlife attempting to survive through several simulation games.
2. Given data related to the results of each game, students will analyze and interpret the data, infer the causes of the results, and make predictions about the real world.
3. Following a discussion of each game, students will explain concepts such as limiting factors, intolerant species, competition, carrying capacity, biomagnification, and bioaccumulation.

### Teacher Responsibilities

Teachers will be asked to help record specific data during each game. They will also be needed to help set up the games while the SOC staff debriefs the students. Finally, because Wildlife Challenge is taught to two to three groups of students at a time, the teacher must help the students remain attentive while rules are being given and games are being debriefed.

### Materials

(Choose a sequence of games appropriate for your group [see attached]. Allow 20-30 minutes for each game)

Quick Frozen Critters: 4 cones, 5 hula hoops, jerseys, popsicle sticks

How Many Bears: food cards, bags, scrap paper, pencils, calculator

Macroinvertebrate Mayhem: 4 cones, invertebrate cards, burlap sacks

Oh Deer: 4 cones, Oh Deer Graph, marker

No Bellyachers: 4 cones, jerseys, popsicle sticks

Deadly Links: 4 cones, colored paper clips, jerseys, bags

Turtle Hurdles: 4 cones, 4 hula hoops, 1 rope, popsicle sticks, beans, bags

## Procedure

1. Begin with the words “Wildlife Challenge” on the chalkboard. Ask students to name wildlife that live in Stokes State forest. Try to name animals at all levels of the food chain: primary producers, primary consumers (herbivores), secondary consumers (omnivores and small carnivores) and tertiary consumers (carnivores). List the animals as students name them.
2. What challenges might these animals encounter while they are trying to survive? List the challenges. Food, shelter, water, and air could limit an animal’s or a population’s chances of survival. Thus, they are called limiting factors.

Have students copy down vocabulary appropriate to the games you have chosen for them.

3. Inform students of the session objectives. Divide the group in half (if larger than 30) and describe how you will rotate through the activities.
4. Explain the rules to each game before you play it. Debrief each game using the questions provided at the bottom of each game description. Have the visiting teachers with your group set up for the second game while you are debriefing the first, and so on.

## Summary

After you have played and summarized each game, gather students together to summarize the activity as a whole. Have students come up with their own definitions for the vocabulary words. Ask students to raise their hand if they survived **each** time they roleplayed an animal. Why not? Which limiting factors were the most difficult? Which limiting factors were caused by humans? How could these be stopped? What were the others caused by? Why is it important to have some limiting factors? What can the students make a commitment to do in order to help wildlife meet these challenges and survive?

## Classroom Extensions

Have students research the populations of animals in their local communities. Are any indicator species present? What limiting factors are the most challenging for these animals to obtain?

# No Bellyachers

## Goals:

1. Students will learn which factors contribute to avoiding a cold or influenza.
2. They will learn to describe how some infectious diseases are spread by water or water droplets.
3. They will identify ways to reduce the chances of becoming infected with a disease.

## Procedure:

1. **Ask the students to name some contagious diseases.** (Pneumonia, Flu, Common Cold, Strep Throat, Mono) **Who has or had a cold or the flu in the last month and what are or were your symptoms?** (Runny nose, cough, sore throat, fever, body aches) **How do we get colds?** (air borne through sneezes and coughs, kissing)
2. Start the game by assigning one student to be infected with a virus or bacteria. To demonstrate their illness they must either run with a hand over their mouth or on their stomach. The goal is to tag as many people as possible.
3. Once players are tagged they must also hold their hand over their mouth or stomach and are not it too and should try to tag as many students as they can.
4. Some students should hop on one leg, to represent weakened or compromised systems. Other students should be given a token to represent stronger cells that will initially have a resistance to the infection. And the remaining students can run around freely. When the students with the tokens are tagged they must hand over their token and then can continue to run around and are not it. If they are tagged a second time then they are it. In a group of 12, have 2 students hop and 2 students with tokens to start. In subsequent games you can alter the ratios.
5. Stop the game after two minutes and record the number of tagged and untagged students.
6. Another way to adapt the game is to change the boundaries to demonstrate how population density affects the spread of disease. **Ask the students when they are more likely to get a cold, in the summer or in the winter and ask them why that is.**

## Summary:

Discuss what happened in each game of "No Bellyachers Tag".

**How did the restrictions and bonus tokens affect the results?** (restrictions caused the students to be tagged quicker because they were not as fast; the opposite is true for bonus tokens)

**How many students remained healthy after two minutes?** (numbers will vary)

**What are some things that may make you more susceptible to catching a cold?**(not enough sleep, getting chilled, not washing your hands after using the toilet)

**What are some healthy habits to develop that can protect against the spread of diseases?** (washing your hands before you eat, dressing appropriately for the weather)

# Quick Frozen Critters

**Goals:** Students will describe adaptations used in predator/prey relationships; and 3) recognize that limiting factors-including predator/prey relationships-affect wildlife populations.

## **Procedure:**

1. Have students count off in 5's. All ones will be predators (coyotes, hawks, or foxes). All the rest will be prey (cottontails, squirrels, and quail).
2. Identify one end of the field as the "food source" and the other end as the "primary shelter." The hula hoops are "temporary shelters."
3. Each prey must gather three food tokens, one at a time, returning to the primary shelter after gathering each one, without being tagged by a predator.
4. Ask students how prey protect themselves from predators in the wild (camouflage, hiding, warning sounds, etc.) In this game, prey may protect themselves by placing at least one foot in a temporary shelter (hula hoop) or by freezing any time a predator is within five feet of them.
5. Predators wear colored jerseys and may only tag moving prey. When they tag someone, they escort them to the nearest boundary where the prey sits down. Each predator must tag two prey to survive.
7. Each game will be five minutes long. Remind prey that they can remain frozen for as long as they like, but if they do not have enough food at the end they will starve to death. In nature, an animal must balance the need to find food with the sometimes conflicting need for safety.
8. Play a few rounds, allowing each student to be both prey and predator.

## **Summary:**

Discuss with the students the ways they escaped capture when they were prey. Which ways were easiest? Which were most effective? What means did they use as predators to capture prey? Which ways were best? What did the predators do in response to a prey animal who "froze"? In what ways are adaptations important to both predator and prey relationships? How do predator/prey relationships serve as natural limiting factors affecting wildlife?

# Macroinvertebrate Mayhem

**Goals:** Students will: describe the effect of an environmental “stressor” on the populations of tolerant vs. intolerant species after a game of tag.

## **Procedure:**

1. Choose one or two students, depending on group size, to be an environmental stressor. What could cause a stream to become “stressed?” (drought, pollution, development) These stressors can alter the conditions of the stream, sometimes resulting in less oxygen for the animals who live there.
2. The rest of the students will be macroinvertebrates living in the stream. Have the rest of the students count off by fives. Distribute their i.d. labels.
3. Macroinvertebrates must try to cross from one side of the stream to the other without being tagged by an environmental stressor. If you are tagged, you must walk to the sideline, sit down, and flip your card for your new identity in the next round.
4. Some macroinvertebrates have hindrances. Caddisflies are very intolerant to low oxygen levels. They build cases around their bodies and attach themselves to rocks for stability. Therefore, you must hop across the stream in a burlap sack, stopping to take a breath every five hops. Demonstrate and hand out bags to caddisflies. Stoneflies undulate their abdomens to increase the flow of water over their bodies when oxygen levels are low. Therefore, stoneflies must stop and do one push-up every ten steps as they run across the stream. Demonstrate. Mayflies move their gills to try to increase oxygen. Therefore, you must flap your arms and spin as you run across the stream. Demonstrate. All other macroinvertebrates in the game can run freely.
5. Put the environmental stressors at midfield and intersperse the macroinvertebrates at one end. Begin the game. Play two more rounds, keeping track of the numbers of each macroinvertebrate population as you line students up to begin the game.

## **Summary:**

1. Call out each macroinvertebrate group and have students raise their hands to indicate whether they survived each round. Supplement this visual display with the numbers you have recorded. What happened to the populations of the intolerant species? Why? (They became lower because of their hindrances).
2. What could you say about the water in a stream which has no intolerant species living in it?
3. What do you call a population that consists of a variety of things instead of just one type? (a diverse population versus a monoculture)

**Reminders:** It is best to have at least four students in each macroinvertebrate group.

# How Many Bears Can Live in this Forest?

**Goals:** Students will identify competition as a limiting factor among animal populations.

## **Procedure:**

1. Each one of you will be a black bear. The marked off area is a forest. You must retrieve food pieces (colored paper) from the forest and bring them back to your den (the plastic bag). You may only pick up one food card at a time and you **MUST** walk. Bears do not run down their food.
2. Choose a few students to play “injured” bears; they must hop on one foot during the game. Choose another few students to be “blind.” They must find food while wearing a blindfold. **You must assign each blind student a parent or teacher to keep them safe while they are looking for food.** Assign another student to be a mother bear. Choose two students to be her cubs. The cubs may not gather food on their own and must stay close to the mother bear. The mother must gather enough food for all of them, but still can only gather one card at a time.
3. Bears may not steal from each other’s dens and they will also not help other bears gather food.
4. Once all the cards have been picked up the game is over.

## **Summary:**

Have students look at the letters on the cards they collected. Each letter stands for food a black bear might eat. Can they guess the foods? (**n**uts, **b**erries and fruit, **i**nsects, **m**eat, **p**lants)

Have the students add up the numbers on their cards. The numbers equal pounds of food. Each adult bear needs 80 pounds of food to survive and cubs need 30 pounds. (This is for a ten-day period). Who survived? Did the mother bear gather enough food? If not, who would she feed first? (Herself) Why? (She can produce many more cubs in future years)

Add up the total amount of food available in the game and determine the number of bears which could have survived by dividing the total by 80. Why didn’t that many bears survive in our game? (some bears were faster, some were injured, location of dens, competition). Competition is one factor that can limit a population.

**If time allows:** Play again and make different students blind, injured, and mother bear.

# Deadly Links

**Goals:** Students will play out the concepts of biomagnification and bioaccumulation to raise their awareness of the potential impacts of pesticide use.

## Procedure:

1. Ask students to define the term food chain (who eats who in a community of organisms).
2. For every 13 students assign 1 hawk, 3 shrews, and 9 grasshoppers. Have the hawks and shrews wear jerseys to identify themselves as such. Make extra students be grasshoppers.
3. Give each grasshopper a paper bag. This bag represents its stomach
4. Explain to the students that in the field are colored paper clips which represent corn that the grasshoppers will eat. Line up grasshoppers across one border of the field, with shrew lined up behind them, and hawks lined up last.
5. The grasshoppers will have about one minute to collect at least 15 food pieces. When the whistle is blown they must stop collecting food because the shrews, who have been waiting quietly by the border, will have the opportunity to hunt. If the shrews catch a grasshopper they take the bag representing its stomach and escort the grasshopper to the sideline where he must sit down. Shrews will hunt for 45 seconds and must catch at least two grasshoppers to survive.
6. After a second whistle is blown, the hawks will be released. They must tag at least three shrews and take the stomach bags that each shrew has collected, also taking the time to escort each tagged shrew to the sideline. Allow the hawks 30 seconds to hunt.

## Discussion:

Have students who survived empty out their bag or bags. Inform them that the pink paper clips actually represent a pesticide that was sprayed on the corn. Have the students count up how many pink paper clips they have. On the dry erase board, keep track of how many pink paper clips each animal from each group had. In which group did animals end up with the most pesticide in their stomachs? (the hawks, or top predators). This is called biomagnification.

In the 1940's, a pesticide called DDT was sprayed on crops. Years later, it was noticed that populations of predatory birds were decreasing. No one could believe that a pesticide which is sprayed on crops could accumulate in a carnivore's body, but it was proven that DDT levels were high enough in the bird's bodies that the eggs they laid lacked hard shells and would not last. This is called bioaccumulation. How did this happen? Some pollutants can travel up the food chain, accumulate there and have long-lasting negative effects. Why do people use pesticides? Are there any alternatives?

# Turtle Hurdles

**Goals:** Students will simulate the life cycle of painted turtles, discover the effects of limiting factors on turtle populations, and evaluate the value or harm caused by those limiting factors.

## **Procedure:**

1. Divide students into two equal groups: painted turtles and limiting factors.
2. Give each turtle a bag with 20 beans inside. They actually will represent a nest of 5 baby turtles; four beans equals one turtle. Give each limiting factor an empty bag. They represent anything that could limit the turtle population. What could limit it? (on land: raccoons, foxes, vehicles, shoreline development; in water: frogs, otters, snakes, bass, great blue herons, getting caught in tangled fishing line, eating litter, water pollution.)
3. Explain the rules of the game as you walk the students through the playing field. Baby turtles hatch on the shore and then must cross to the water and spend 5 years in the lake. This means you must run back and forth between the year zones and pick up one year token (popsicle stick) at each one. When you have all five, you are mature enough to return to the shore to lay more eggs.
4. If a turtle is tagged by a limiting factor, he or she must stop and count out four beans to place in the limiting factor's bag. If a turtle loses all 20 beans, it has died. It now becomes a building, which means it sits down on the shore.
5. Turtles can hide and rest in the grass zones; limiting factors can not tag them when at least one foot is in the grass zone.
6. Limiting factors may not (1) tag the same turtle twice in a row, (2) tag a turtle when he is counting out beans and (3) must stay at least four steps away from a turtle who is counting out beans.
7. Set the limiting factors up on the shore and the lake, designating what each is as you do so. Line the turtles up along the shore. Begin the game. The activity ends when all turtles have either become buildings or have returned to the shore to lay eggs.

## **Discussion:**

1. How many students survived? Which limiting factors tagged at least one turtle? (It is likely that many turtles died. This is why painted turtles may lay up to 20 eggs in a nest each year).
2. Which of the limiting factors were a part of nature? (Animal predators). Which could be stopped or controlled? (vehicles, buildings, pollution, etc.)

# Oh Deer!

**Goals:** Students will recognize that wildlife populations sometimes fluctuate according to an area's carrying capacity.

## **Procedure:**

1. Ask students to name three essential components of a habitat: food, water, and shelter.
2. Teach children the three symbols for each:
  - food—both hands on stomach
  - water—holding an imaginary cup to the mouth
  - shelter—making a pretend roof over head with both hands
3. Have students count off in fours. Line up one's across one end of a 10-20 yard playing area. Line up the rest of the students across the other end.
4. The ones are deer. Each deer needs to decide which component he/she will look for and make the appropriate symbol.
5. The rest of the students are the habitat. Each habitat must decide what component he/she will represent and make the appropriate symbol.
6. Both lines turn away from each other before making their symbol. When the instructor says "Oh Deer!" the lines turn around, still making their symbols. The deer must race to the habitat, making their symbol the whole time, find the component that they need, and bring it back with them. That component becomes a deer for the next round. Any deer who do not find the correct component do not survive and become part of the habitat. Only the deer move, not the habitat.

## **Summary:**

After playing a few practice rounds, keep track of the number of deer per round on the graph on the reverse side. Connect the dots on the graph while students watch.

How did the population change?

Does the deer population fluctuate like this in the real world? Why?

Explain the concept of carrying capacity—the number of animals that a given area of land can support. At what number of deer did you exceed the carrying capacity in this game (i.e. on the graph, after what numbers did the population tend to drop?) What, then, was the carrying capacity for this game?

**If time allows:** Play again and designate one student to be a hunter. The hunter must begin in his den—the hula hoop off to the side—and skip onto the field to tag a deer. Any deer he tags must be escorted back to the den. During the next round, that deer becomes a second hunter. If a hunter does not tag a deer, he becomes part of the habitat.