

POPULATION GAME

BIO Game/Simulation
KEY Population
Carrying Capacity

OVERVIEW

By playing the roles of deer, the youngsters discover the relationship between population size and food supply.



BACKGROUND



A **population** is a group of organisms of one kind that lives in the same area. The size of a population (that is, the number of individuals in the group) may change greatly over a period of time. Among animals such as deer or field mice, populations may double, fluctuate slightly, decrease slowly, or “crash” to a very low number from one year to the next.

Many factors influence the size and location of a population, but three are of extreme importance: (1) competition for available food, (2) the size of the food supply, and (3) dispersal or migration to new feeding territories. The amount of food available to a population is probably the most crucial factor in determining an area’s carrying capacity. The **carrying capacity** is the

greatest number of organisms that can be supported (carried) by an area without damaging it.

Usually a population of deer or mice will forage for food in the same area year after year. This well established territory is known as the population’s **home range**. Usually only extreme conditions, such as lack of food, loss of habitat, or severe weather, will force a population out of its home range. When a population’s home range no longer contains enough food, the population may disperse in search of new feeding areas.

CHALLENGE: FIND OUT HOW MANY DEER CAN SURVIVE IN YOUR HERD’S HOME RANGE.

MATERIALS



For each youngster:

10 home-range poker chips (one color) 6
new-range poker chips (another color) 4
plastic sandwich bags

For the group:

flagging or cord for marking home-range
boundaries
1 kitchen timer or watch with a second
hand
1 data board and marking pen

PREPARATION



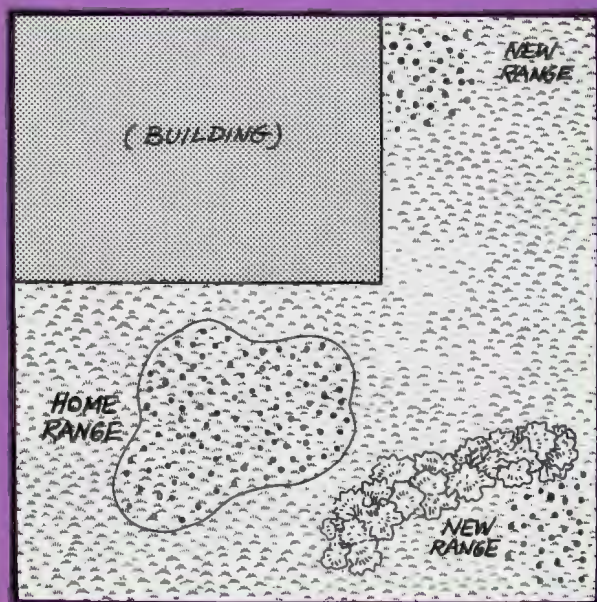
Group Size. This activity is suitable for ten to fifty youngsters.

Time. Plan on forty to fifty minutes for this activity.

Site. A large level or gently sloping grassy area is best.

Preparing the Site

1. Use the flagging or cord to mark off a circle approximately ten meters in diameter for the home-range area. Scatter the home-range poker chips throughout the circle, ten chips for each youngster.



2. Choose two areas that are visually obscured from the home range and at least ten meters away. Scatter half of the new-range poker chips throughout each area. These areas will serve as new feeding ranges and should not be visible to the youngsters from the home range.

Data Board. Reproduce the "Number of Survivors" chart on the data board.

YEAR	# OF DEER AT START	# OF DEER AT END	
1			
2			
3			
4			
5			

ACTION



Introducing the Game

1. Tell the youngsters that they will be playing a game involving a population of deer and that each deer will be represented by a small plastic bag. Define **population** as a group of organisms of one kind that lives in the same area. Then explain that the area where a population of animals usually forages for food is called the **home range**. Point out the circle and the chips on the lawn. Explain that the circle represents the deer's home range and that the chips represent the deer's food (plants).

2. Tell the kids that in order for a "deer" to survive a one-minute "year," it must obtain at least five chips, but not more than ten.



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Sharing or pooling of chips by different players is not permitted—deer don't share their food!

Note to the leader: At the end of each "year," you must remove the "deer" (bags) that have not survived. At the beginning of each new year, you will hand out an additional bag for each deer that survived (simulating reproduction). If any youngsters are left without a bag, redistribute the bags among the youngsters so that everyone can participate.

The First Year

1. Give each kid one plastic bag (deer).
2. Set the timer for one minute, and challenge the youngsters to collect enough food chips for their deer to survive. (If you find one minute is more time than necessary, you may reduce the time available for foraging.)
3. At the end of the one-minute period, record on the data board the number of deer that *started* the round and the number that *survived* the first year. Collect any "deer" that did not survive. (All the deer should have survived the first year, since there were enough chips for all of them.)

The Second Year

1. Explain to the youngsters that populations grow through reproduction. Tell them that they will simulate the effect of reproduction by adding one deer for every deer that survived the first year.
2. Hand out the additional bags. All of the participants should now be collecting food for two deer.
3. Ask the youngsters to redistribute the food chips in the home range.
4. Tell the youngsters that **carrying capacity** is the greatest number of organisms of one kind that can survive in an area. Point out the number of deer entering "Year Two" and ask the group to predict

the number that will survive. (At this point, add a "Carrying Capacity Predictions" column to the chart.)

YEAR	# OF DEER AT START	# OF DEER AT END	CARRYING CAPACITY PREDICTIONS
1	14	14	
2	28	23	18, 20, 25
3	46		15, 18, 23
4			
5			

5. Set the timer. On signal, each youngster should try to collect at least five food chips in *each* of his or her bags.
6. At the end of "Year Two" record the number of surviving deer on the data board. Compare the number of survivors with the group's prediction of carrying capacity. Collect the casualties.

The Third Year

Once more, give each youngster an additional bag for each surviving deer. Redistribute the collected food chips in the home range and play the round exactly as "Year Two" was played, recording the carrying capacity predictions and number of survivors on the data board.

The Fourth Year

1. Hand out one more bag for every surviving deer.
2. Announce that because of the large number of deer in the population last year, the plants that the deer eat were damaged, and food production has been lowered. Remove one-fourth of the food chips and redistribute the remaining chips in the home range.

3. Point out the number of deer that are entering the round and remind the youngsters of the reduced food supply. Ask them how many deer they think will survive now.

4. Set the timer and let the round begin. Record the results.

The Fifth Year

1. Ask the group what they think a herd of deer might do when its home range no longer produced enough food for the herd to survive. If necessary, introduce the idea of dispersing to new feeding areas. Tell the group that in this round, after all the available food in their home range has been eaten, they may disperse and search for new feeding areas.

2. Hand out one more bag for each surviving deer, redistribute the chips (the same number used in "Year Four") in the home range, and let the round begin.

3. At the end of the round, call everyone together and find out how dispersal affected the number of deer that survived.

THINKING ABOUT POPULATIONS



1. In which round of the game was it easiest for each of your deer to survive? In which round was it hardest? Why?

2. In this game, which factors determined the carrying capacity of the home range?

3. If a person regularly, and over a long period of time, put out a lot of corn for deer in a small area, what would happen to the carrying capacity of that area for deer? What would be the effect on the deer population? What would happen to the deer if the person suddenly stopped supplying the corn?

4. What factors might reduce the size of populations?

5. How do you think the growth of human populations is similar to the growth of other animal populations? How is it different?

BRANCHING OUT



The youngsters may wish to maintain a small population of real animals and observe changes in the population over a short period of time. Guppies are good subjects for population growth experiments. Starting with three of the little fish (one male and two females) in a properly maintained aquarium, youngsters can follow changes in the size of the population over several months.

