Oh Deer!

Overview

In this wildlife population activity students will: 1) identify and describe food, water, and shelter as three essential components of habitat; 2) describe the importance of good habitat for animals; 3) define "limiting factors" and give examples; and 4) recognize that some fluctuations in wildlife populations are natural as ecological systems undergo constant change.

North Carolina Standard Course of Study

4.01 Describe the flow of energy and matter in natural systems:

- Energy flows through ecosystems in one direction, from sun through producers to consumers to decomposers.
- Matter is transferred from one organism to another and between organisms and their environments.

7.01 Describe ways in which organisms interact with each other and with non-living parts of the environment:

- Coexistence / Cooperation / Competition

7.02 Investigate factors that determine the growth and survival of organisms including:

- Water
- Energy

7.03 Explain how changes in habitat may affect organisms.

7.05 Examine evidence that overpopulation by any species impacts the environment.

Textbook References

McDougal Littell

Many of the objectives of the NCSCOS that *Oh Deer!* covers are in Unit D, Chapter 2 (starting on p 42). You might want to begin Chapter 2 with *Oh Deer!* and refer to it throughout your study in the chapter.

Prentice Hall

Populations and the various factors that affect populations are covered in Chapter 11, Section 11.2 (pp 391-401).

Background

A variety of factors affects the ability of wildlife to successfully reproduce and to maintain their populations over time. Availability of food, water, and shelter are critical factors. Additional factors include disease, predator/prey relationships, varying impacts of weather conditions from season to season (e.g., early freezing, heavy snows, flooding, and drought), accidents, environmental pollution and habitat destruction and degradation.

The number of individuals of a particular species that a habitat can support over time is called the **carrying capacity**. This is a dynamically changing number, not a static number. Natural as well as human-caused limiting factors determine the carrying capacity for a species in a given habitat. If limiting factors become excessive, then the species can become threatened, endangered, or even extinct in the affected area.

The most fundamental of life's necessities for any animal are food, water, shelter and space in a suitable arrangement. Without these essential components, animals cannot survive and reproduce.

This activity is designed to help students learn that:

- good habitat is the key to wildlife survival;
- a population will continue to increase in size until the carrying capacity that is determined by limiting factors is exceeded;
- these limiting factors contribute to fluctuations in wildlife populations; and
- nature is never in static "balance," but is constantly changing.

Wildlife populations are not static. They continuously fluctuate in response to a variety of stimulating and limiting factors. We tend to speak of limiting factors as applying to a single species, although one factor may affect many species. Natural limiting factors or those modeled after factors in natural systems, tend to maintain populations of species at levels within predictable ranges. This kind of "balance in nature" is not static, but generally tends to cycle up and down. Some species fluctuate or cycle annually. Quail, for example, may start with a population of 100 pairs in early spring; grow to a population of 1200 birds by late spring; and decline slowly to a winter population of 100 pairs again. This cycle is mostly controlled by the habitat components of food, water, shelter and space, which are limiting factors that vary over the course of the year. Habitat components are the most fundamental and thereby the most critical of limiting factors in most natural settings.

This activity is intended to be a simple but powerful way for students to grasp some basic concepts: that everything in natural systems is interrelated; that populations of organisms are continuously affected by factors in their environment; and that populations of animals do not stay at the same static number year after year, but rather are continually changing in a process of dynamic equilibria in natural systems.

The major purpose of this activity is for students to understand the importance of suitable habitat as well as factors that may affect wildlife populations in constantly changing ecosystems.

Materials

Materials for the whole class

*Materials to be supplied by the teacher or the students are marked with an asterisk.

- Large area—either indoors or outdoors—large enough for students to run, e.g., a playing field. Establish two lines about 20 yards apart (see Figure 1). Safety note: If necessary, have students remove trip hazards such as sticks and stones before starting the exercise.

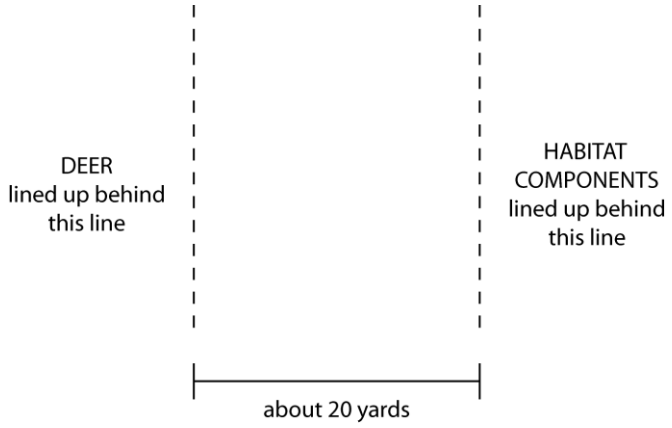


Figure 1.

- 60 each of green, blue, and brown construction paper cut into squares approximately 3"x 3", to represent food, water, and shelter respectively. Thirty squares of all 3 colors should be placed in each of 2 boxes, one box for the deer students behind their line on their end of the field and one box for the habitat component students on their end.
- Surveyor flags
- String
- A transparency tally sheet for gathering data (from blackline master below)
- Transparencies for **Extensions** activities (from blackline masters below)
- Transparency for **Assessment** activity (from blackline master below)

Materials for individual students

- Graph paper (from blackline master below)
- Photocopy of *Carson County* assessment activity
- *Pencils and erasers
- *Rulers

Preparation

Inform students the day before that you are planning an outdoor activity that will require some running so that students can dress appropriately.

Procedure

1. Begin by telling students that they are about to participate in an activity that emphasizes the most essential things that animals need in order to survive. Review the essential components of habitat with the students: food, water, shelter, and space in a suitable arrangement. This activity emphasizes three of those habitat components—food, water and shelter—but the students should not forget the importance of the animals having sufficient space in which to live, and that all the components have to be in a suitable arrangement or the animals will die.

2. Ask your students to count off in fours. All the *1s* go to one area; all *2s*, *3s* and *4s* go together to another area. Mark two parallel lines on the ground or floor 15 to 20 yards apart. Have the *1s* line up behind one line; the rest of the students line up behind the other line.

3. The *1s* become "deer." All deer need good habitat in order to survive. Again ask the students what the essential components of habitat are: **food, water, shelter** and **space in a suitable arrangement**. For the purposes of this activity, we will assume that the deer have enough space in which to live. We are emphasizing food, water and shelter. The deer (the *1s*) need to find food, water and shelter in order to survive.

4. The *2s*, *3s* and *4s* are food, water and shelter, respectively—components of the habitat. Each student gets to choose at the beginning of each round which component he or she will be during that round.

5. The habitat component students take one card of their choosing out of their box (green, blue or brown). The deer students take one card out of their box, designating the habitat component they are going to try to catch. The activity starts with all players lined up behind their respective lines (deer on one side; habitat components on the other side), and **with their backs to the students at the other line**. The students hold their cards close to their chests so that the other group cannot see what they have chosen.

6. When you can see that the students are ready, count: "One . . . two . . . three." At the count of three, each deer and each habitat component turns to face the opposite group, now holding their cards so that they are visible to the other student group.

7. When deer see the habitat component they need, they run to it. Each deer must hold the card of what it is looking for until getting to the habitat component student with the same card. Each deer that reaches its necessary habitat component takes the "food," "water," or "shelter" back to the deer side of the line. This is to represent the deer's successfully meeting its needs, and successfully reproducing as a result. Any deer that fails to find its food, water, or shelter dies; the student representing this deer then joins the habitat group. That is, in the next round, this student becomes a habitat component and so is available as food, water, or shelter to the deer that are still alive.

NOTE: When more than one deer reaches a habitat component, the student who gets there first survives. Habitat components stay in place on their line until a deer needs them. If no deer needs a particular habitat component during a round, the habitat

component just stays where it is in the habitat. The habitat student can, however, change which component it is from round to round.

8. The teacher, as facilitator, keeps track of how many deer there are at the beginning of the activity, and at the beginning of each round, after reproduction. Continue the activity for approximately 15 rounds. Keep the pace brisk and the students will thoroughly enjoy it.

9. For round 8 or 9, go to the habitat group and quietly inform all of them to choose shelter cards. This will represent a drought with no food or water available. The deer population should crash but will rebound over the next rounds.

Note: If all of the deer students happen to chose food and water cards and none chooses a habitat card, then all deer will die and the population will go extinct. The activity then can be restarted by allowing 3-4 students to become deer as if they had immigrated into the area from the surrounding area.

10. At the end of the 15 rounds, gather the students together to discuss the activity. Encourage them to talk about what they experienced and saw. For example, they saw a small herd of deer (seven students in a class size of 28) begin by finding more than enough of its habitat needs. The population of deer expanded over two to three rounds of the activity until the habitat was depleted and there was not sufficient food, water and shelter for all the members of the herd. At that point, deer starved or died of thirst or lack of shelter, and they returned as part of the habitat. Such things happen in nature also.

NOTE: In real life, large mammal populations might also experience higher infant mortality and lower reproductive rates.

11. Using a flip chart pad or a chalkboard, post the data recorded during the activity. The numbers of deer at the beginning of the activity and at the end of each round represent the number of deer in a series of years. That is, the beginning of the activity is year one; each round is an additional year.

12. Graph these data, on an overhead transparency if possible, starting with the initial deer population at Year 0. (See the **Extension** section below for some examples.)

The students will see this visual reminder of what they experienced during the activity: the deer population fluctuated over a period of years. This is a natural process. Wildlife populations tend to peak, decline, and rebuild, peak, decline, and rebuild—as long as there is good habitat and sufficient numbers of animals to successfully reproduce. If a limiting factor becomes excessive, be it natural or human-caused, then the animal population can crash and even go extinct if conditions do not improve quickly enough.

Reflection/Discussion

In discussion, ask the students to summarize some of the things they have learned from this activity. Some suggested discussion questions:

- What do animals need to survive?
- What are some of the “limiting factors” that affect their survival?

- How did it feel when you were in a large population with very little habitat available?
- How did it feel when you were in a small population with an abundance of habitat available?
- Are wildlife populations static, or do they fluctuate, as part of an overall "balance of nature?"
- Do plant populations behave similarly to animal populations?
- Is nature ever really in static "balance" or are ecological systems involved in a process of constant change?

Assessment

In addition to the imbedded assessment as you lead the class discussion, a written assessment is included as a black line master at the end of this section. We suggest discussing the graphs (transparencies provided) in the **Extensions** section first, before using this assessment.

Extensions

1. In the Tally Sheet for *Oh Deer!*, add a third column for yearly population change. Then have students calculate how many more or fewer deer there are for a given year compared to the previous year by subtracting the previous year population from the current year population. A positive number means that the population increased that year and a negative number means that the population decreased that year.

2. Present Table 1 and Graph 1 and ask students to evaluate the health of this deer population. Have students speculate on causes of increases and decreases.

Year	Population
1990	121
1991	165
1992	154
1993	110
1994	81
1995	63
1996	68
1997	77
1998	59
1999	41
2000	42
2001	55
2002	43
2003	37
2004	33

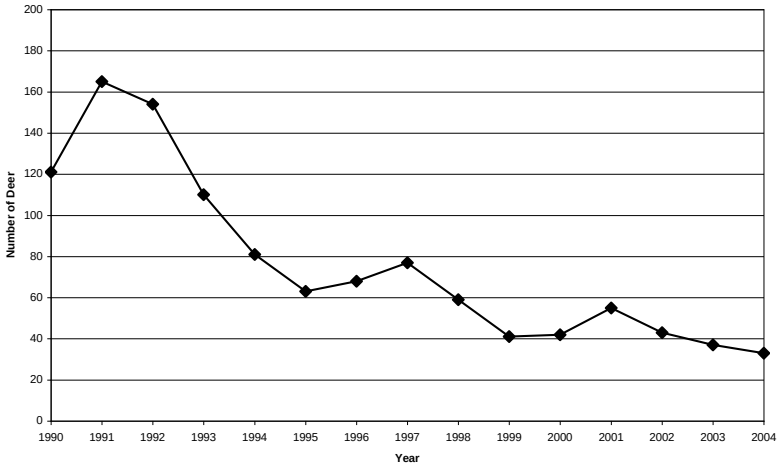


Table 1 and Graph 1.

Some possible responses:

- Increases can be the result of:
  - Very few deer with lots of resources
  - New hunting restrictions
  - New green spaces
  - Less predation or disease
- Decreases can be the result of:
  - An increase in human developments (homes, roads, shopping centers, parking lots, etc.)
  - More predation or disease
  - Forest fires
  - Drought
  - Increased hunting
- Decreases might be followed by increases, since after a decrease there might be more resources available for fewer animals.
- Increases could be followed by decreases because of population crashes due to limiting resources.

The population in Graph 1 is probably not 'healthy,' since it seems to be in steady decline.

3. Present Table 2 and Graph 2 and ask students to evaluate the health of this deer population. Have students speculate on causes of increases and decreases.

Year	Population
1990	119
1991	103
1992	114
1993	86
1994	63
1995	68
1996	35
1997	14
1998	24
1999	42
2000	51
2001	83
2002	121
2003	130
2004	128

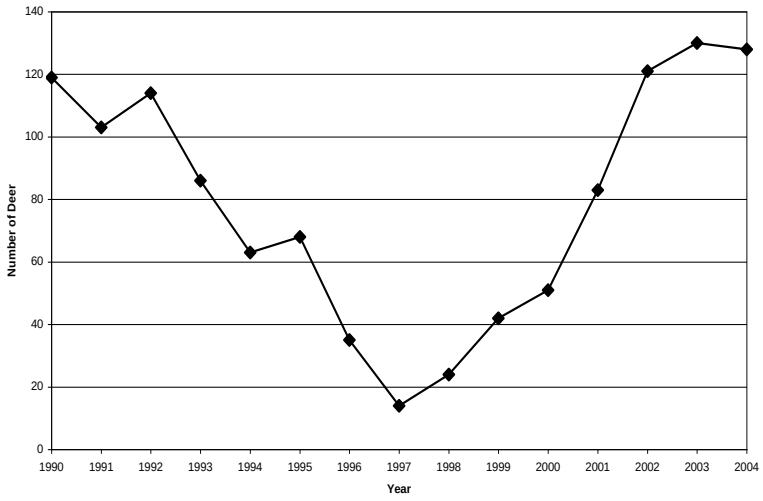


Table 2 and Graph 2.

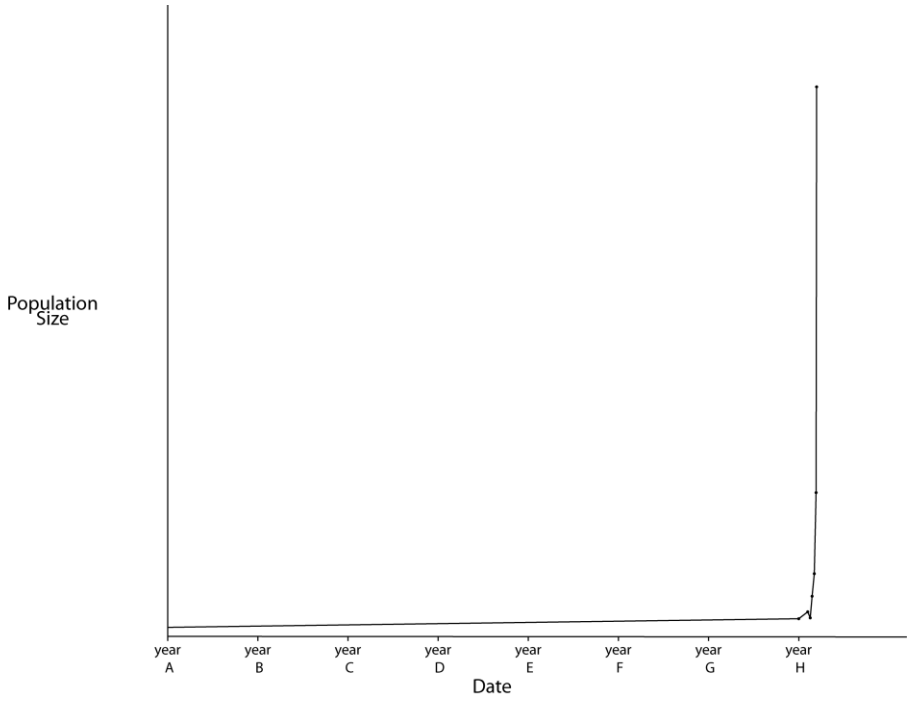
Why was the decrease followed by an increase? Some possible explanations:

- Urban sprawl caused the decrease. Then people decided to set aside parkland and limit the sprawl.

- The decrease could have been caused by drought followed by forest fires that destroyed the habitat. Then the deer slowly recovered as the habitat grew back.
- Perhaps the population has actually overshot the carrying capacity and will decrease again in the future.

This population looks like it was stressed for awhile, but then has rebounded. It seems healthy again in that it has increased to its original level.

4. Present Graph 3 and ask students to describe what they see. Tell them that this is an actual population of real organisms.



Graph 3.

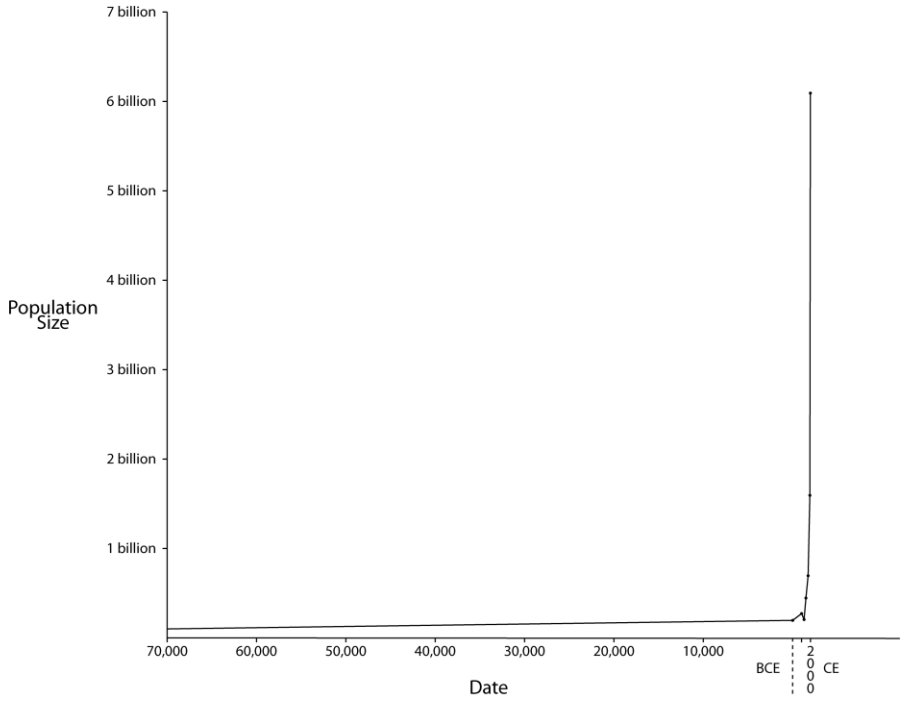
Some possible responses:

- Very slow population growth from year A through year H.
- Modest increase shortly after year H.
- Small downward blip followed by a very rapid increase.

Now ask students what they think will happen in the future. Some possible responses:

- The population may stabilize at a high level (perhaps with small fluctuations).
- The population may decrease and then stabilize at some lower level.
- The population may 'crash' and perhaps even go extinct. (This is less likely, since *some* individuals usually survive a population crash.)

Next, show Graph 4 and explain that this is a graph of the population of human beings on Earth.



Graph 4.

The prehistoric data have been estimated by paleontologists. Ask students what they see. Point out the downward blip. Some possible responses:

- For most of the existence of humans on Earth, the population size was fairly stable and was maintained at a low level.
- Around the time of the 1st century of the Common Era, the population began to grow more quickly.
- The downward blip shows the population crash that occurred during the Bubonic Plague (Black Plague) in the 14th century. Some estimates claim that 30% of the population of Europe (perhaps 25 million people) died between 1347 and 1352—from a high of 75 million to about 50 million.
- The population then began to grow at an extremely high rate and has continued this growth to the present day.
- Based on their predictions from Graph 3, they may infer that the human population might:
    - stabilize at a high level,
    - decrease and stabilize at a lower level, or
    - crash and perhaps go to extinction.

Finally, ask students, "If you were in a position of some authority, what suggestions would you provide to the world to deal with this situation?" Some possible responses:

- Limit the number of children.
- Don't cure all diseases.
- Don't intervene in famine.

What has human experience shown?

- Have governmental regulations limiting the number of children in China been effective in reducing population growth?
- Is population growth faster in countries where is human disease control is effective or in countries where disease control is poor?
- Is population growth faster in countries where human famine is common or in countries where famine is rare?

These are obviously controversial, ethical issues. This is a good chance to talk through these kinds of issues with students.

Assessment

Hand out photocopies of the Carson County assessment activity. Ask students to graph the data and write a report as explained in the directions.

Some possible responses:

- This is probably a healthy population, with fairly regular decreases cycling with increases.
- Students should have some reasonable explanation for the sharp decrease in 1995-1996. For example,
    - Drought.
    - Disease.
    - Forest fire.

- Evidence of long-term health is that the population rebounded so quickly after 1996.

Acknowledgements

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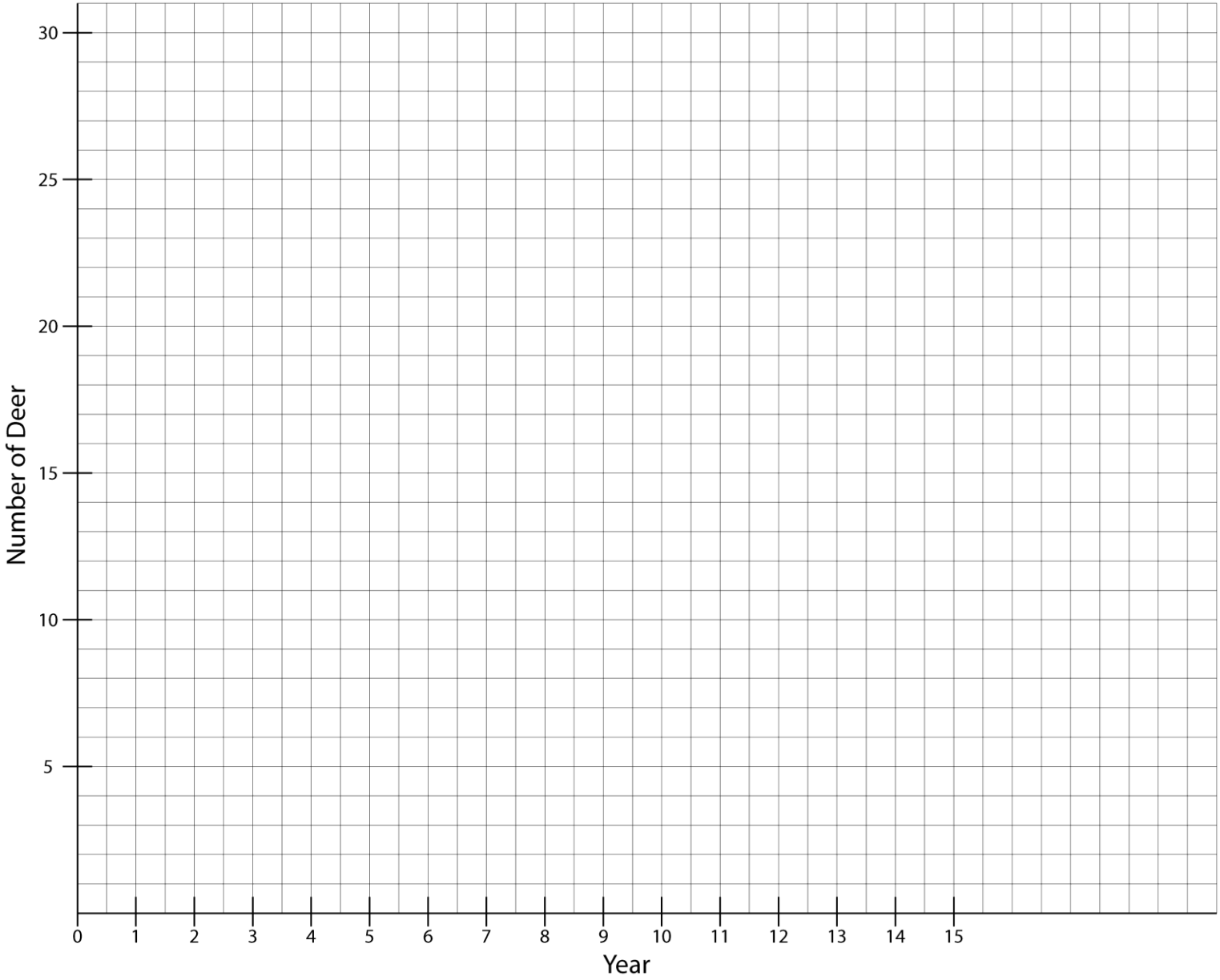
Tally Sheet for *Oh Deer!*

Year	Population
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	


30
25
20
15
10
5
Number of Deer
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Year

Year	Population
1990	121
1991	165
1992	154
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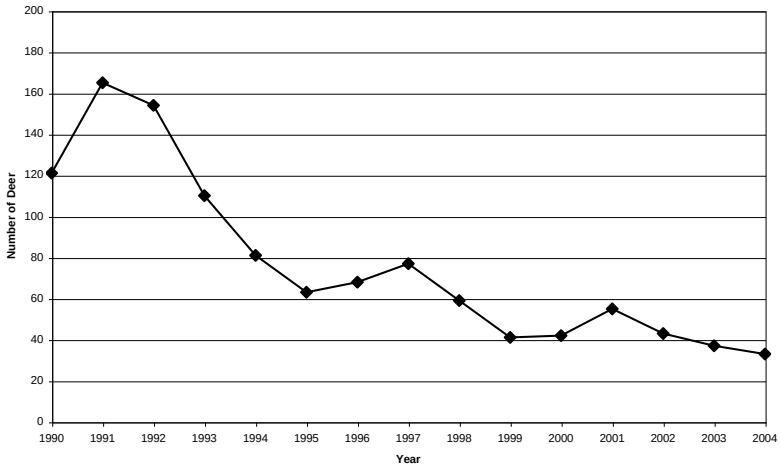


Table 1 and Graph 1.

Year	Population
1990	119
1991	103
1992	114
1993	86
1994	63
1995	68
1996	35
1997	14
1998	24
1999	42
2000	51
2001	83
2002	121
2003	130
2004	128

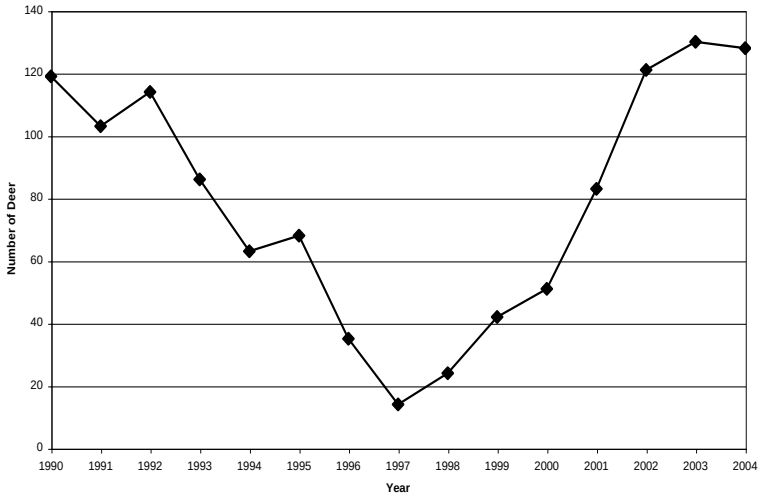
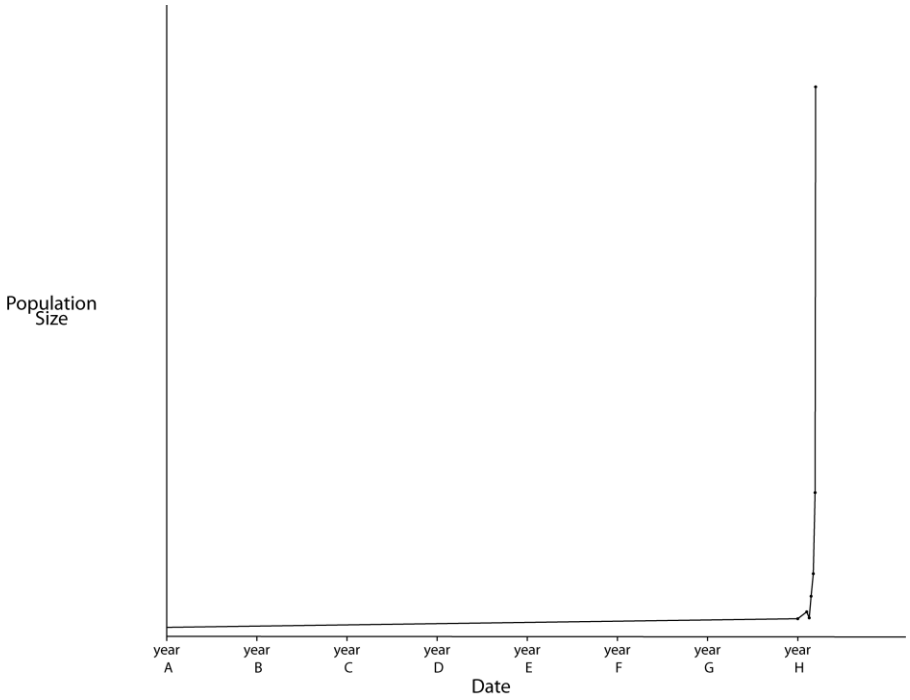
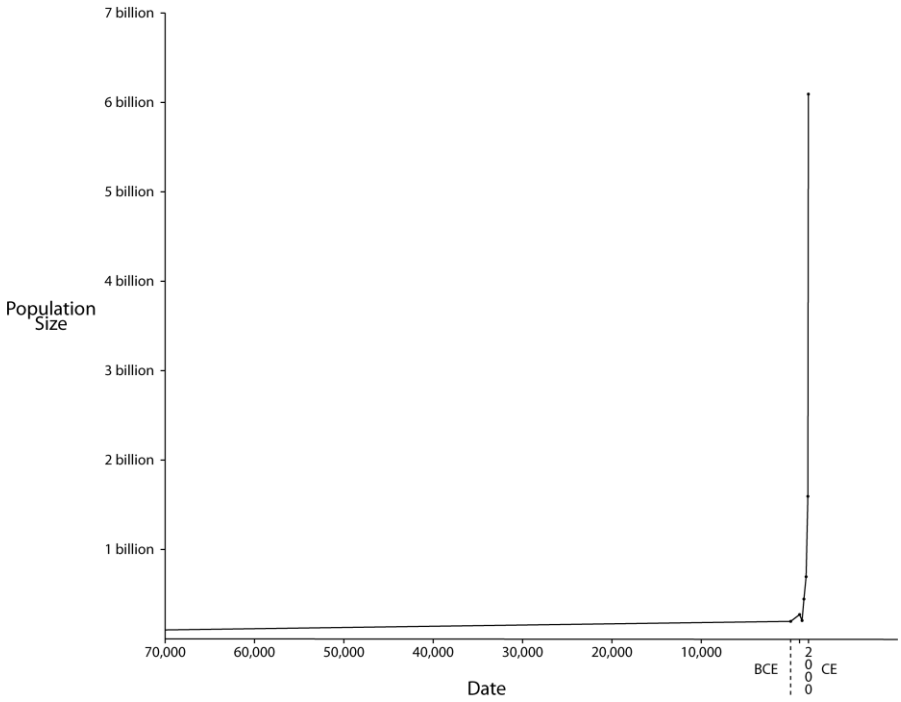


Table 2 and Graph 2.


Population Size
year A
year B
year C
year D
year E
year F
year G
year H
Date

Graph 3.


7 billion
6 billion
5 billion
4 billion
Population Size
3 billion
2 billion
1 billion
70,000
60,000
50,000
40,000
30,000
20,000
10,000
BCE
2000 CE
Date

Graph 4.

Carson County

You recently moved to Carson County as the new wildlife manager. You are presented with the following deer population data:

Year	Population
1990	143
1991	122
1992	150
1993	115
1994	129
1995	152
1996	41
1997	74
1998	83
1999	116
2000	185
2001	129
2002	146
2003	120
2004	131

Your job is to graph these data so you can learn about the deer population. You need to write a report and explain the "health" of the deer population. Your report should address the following issues:

- Look for any sudden population change and describe factors which could be responsible for the change.
- Determine the overall "health" of the deer population and provide evidence to support your decision.
- Identify any concerns you might have about the deer population.