CIBL

Oh Deer!

NC Standard
LS.8.2.1 &
LS.8.2.2

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Activity Description & Estimated Class Time

In this two-day activity students play the role of a deer population. The number of deer in the population fluctuates throughout the activity based on availability of resources in the habitat. Students will graph results and discuss factors that affect populations in nature.

Correlations to NC Science Standards

LS.8.2.1 Carry out investigations to explain how changing biotic and abiotic factors such as food, water, shelter, and space affect populations in an ecosystem.

LS.8.2.2 Construct an explanation to summarize the relationships among producers, consumers, and decomposers including the positive and negative consequences of such interactions including: coexistence and cooperation, competition (predator/prey), parasitism, and mutualism.

Learning Target

Students will demonstrate knowledge and understanding of the following ideas and content:
- Identify and describe food, water, and shelter as three essential components of habitat
- Describe the importance of good habitat for animals
- Define "limiting factors" and give examples
- Recognize that some fluctuations in wildlife populations are natural as ecological systems undergo constant change.

Brief Science Background

A variety of factors affects the ability of wildlife to successfully reproduce and maintain their populations over time. 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, habitat destruction, and degradation are among these factors.

The number of individuals of a particular species that a habitat can support over time is called the carrying capacity. This is dynamic and changing, not static. Both naturally-caused and human-caused factors prevent wildlife populations from reproducing in numbers greater than their habitat can support. An excess of such limiting factors, however, can threaten, endanger, or eliminate whole species.

The most fundamental of life's necessities for any animal are food, water, shelter and space in a suitable arrangement. Without these, populations of animals do not maintain their numbers.

This activity is designed for students to learn that:
- Good habitat is the key to wildlife survival
- A population will continue to increase in size until some limiting factors are imposed
- Limiting factors contribute to fluctuations in wildlife populations
- Nature is never in "balance," but is constantly changing.

Wildlife populations are not static. They continually 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

Brief Science Background con't.

levels within predictable ranges. In this kind of "balance in nature," populations go up and down, something like a teeter-totter. 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 appears to be almost totally controlled by the habitat components of food, water, shelter and space, which are also limiting factors. Habitat components are the most fundamental and critical limiting factors in most natural settings.

The purpose of this activity is for students to understand the importance of habitat as well as factors that affect wildlife populations. This activity is a simple but powerful way for students to learn how things in natural systems are interrelated; that elements of the environment continually affect populations; and that populations of animals do not stay at the same number year after year, but that their numbers continually change.

Part 1 — Oh Deer!

Materials

Materials for the whole class
- Large area, either indoors or outdoors, large enough for students to run
  - ex. a playing field or football field.
- 60 each of green, blue, and brown construction paper cut into squares approximately 3"x 3", to represent food, water, and shelter respectively.
- Surveyor flags (to help mark the lines)
- String
- 1 copy Tally Sheet for Oh Deer! (SD 1) for each class

Materials for each student
- 1 sheet of graph paper or 1 copy of Oh Deer! Graph, blank (SD 2)

Preparation
allow approx. 20 min.

1. In your large area, establish two lines about 20 yards apart.

2. If there are not already distinguished lines, use the string to create them.

3. Place the surveyor flags on the boundary edges.

DEER
lined up behind
this line

HABITAT
COMPONENTS
lined up behind
this line

about 20 yards
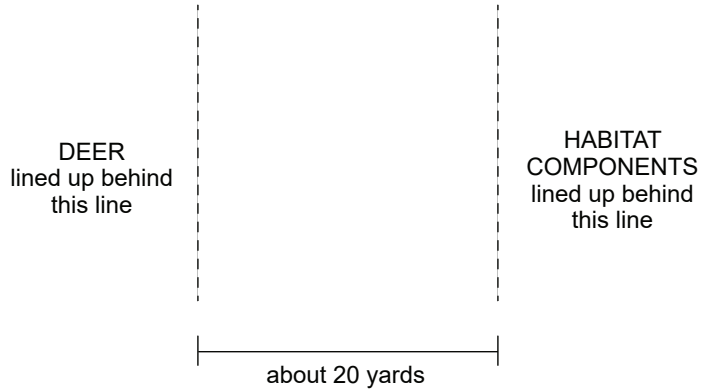
4. Thirty squares of all 3 colors of construction paper squares should be placed in each of 2 boxes, one box for the deer students behind their line on their end of the field and one box for the habitat components students on their end.
   Inform students the day before that you are planning an outdoor 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. Ask students "What are 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. Take the students to the area where they will play the game.

3. Ask students to count off in fours. Ask all the 1's to line up behind one line, and the 2's, 3's, and 4's to line up behind the other line.

4. The 1's are "deer." Explain that deer need a good habitat to survive. Again ask the students what the essential components of habitat are: food, water, shelter and space in a suitable arrangement. For this activity, assume that the deer have enough space. This activity will emphasize food, water and shelter. The deer (the 1's) need to find food, water and shelter in order to survive.

5. The 2's, 3's and 4's represent the food, water, and shelter components of the habitat. At the beginning of each round, each of these students chooses which component he or she will be during that round.

6. Have students line 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 habitat students take one card out of the box (green, blue or brown). This card represents a habitat component (green = food, blue = water, and brown = shelter).The deer students take one card out of the box, designating the habitat component they need in order to survive. **Make sure the students keep their backs to the other line while they are choose their habitat component.**

7. Inform students that at the count of three, every student turns to face the opposite group and shows their card. At this time the deer will move quickly toward the habitat trying to find the habitat component they need in order to survive. They want to find the matching color square. The habitat students will not move. When the students are ready, count: "One. . . two. . . three."

8. Each deer that reaches its necessary habitat component takes the food, water, or shelter person back to the deer side of the line. The habitat person now becomes a member of the deer population. 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 and becomes part of the habitat. That is, in the next round, the deer that died becomes a habitat component and so is available as food, water, or shelter.
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 person can, however, change which component it is from round to round.
Practice one round with your students before keeping track of data.

9. The teacher, as facilitator, keeps track of how many deer there are at the beginning of the activity, and records how many are still alive at the end of each round using

Procedure con't.

SD 1. Continue the activity for approximately 15 rounds. Each round represents one year. Keep the pace brisk and the students will thoroughly enjoy it.

10. At about round 8 or 9, go to the habitat group and quietly ask all of them to choose shelter cards just for this one round (after this, they should return to choosing at random). **This represents a drought with no food or water available.** The deer population should crash but will rebound over the next rounds.

11. At the end of the 15 rounds, introduce a predator, a wolf, to look at the Predator/ Prey relationship. Select one student from the habitat to play the role of predator, a wolf. Continue to play the game and have the wolf roam in the middle of the playing area. As the deer students move toward the habitat, the wolf can capture one deer per round. The captured deer will now become a wolf. This represents a successful year for the wolf that results in the wolf reproducing. Do this for only a few rounds and use this experience to lead a discussion on how predator/prey populations are interdependent.

12. Return to the classroom to discuss the activity.

13. Encourage the class 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 when too little food, water and shelter remained for all the members of the herd. At that point, deer starved or died of thirst or lack of shelter. The deer also has to compete with each other for their needs. Such things also happen in nature. **This is a good stopping point if time does not allow for conclusion of the activity.**

14. Project the data recorded during the activity. The number of deer at the beginning of the activity and at the end of each round represents 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.

15. Give each student a sheet of graph paper or a copy of SD 2 and have them create a graph to represent the data.

16. 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 as long as factors limiting the population do not reach the point where the animals cannot successfully reproduce. Wildlife populations tend to peak, decline, and rebuild, peak, decline, and rebuild—as long as there is good habitat and suffi-cient numbers of animals to reproduce successfully.

17. After students construct their graphs, lead a reflection/discussion. 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 small population of deer with an abundance of habitat available?
    - How did it feel when you were in a large population of deer with a limited amount of habitat available?
    - Are wildlife populations static (unchanging) or dynamic (constantly fluctuating) over time? What evidence do you have to support your claim?

Part 2 — Wildlife Biologist Scenarios

Materials

Materials for the whole class
The ability to project:
- Deer Population 1 (SD 3)
- Deer Population 2 (SD 4)
- Actual Population (SD 5)
- Actual Population - with dates (SD 6)
- Carson County (SD 7)

Materials for the whole class
- graph paper

Procedure

1. Review populations and factors which cause them to fluctuate over time.

2. Inform the class that they will be asked to play the role of "Wildlife Biologist." They will be presented with different population graphs and asked to speculate on them.

3. Project Deer Population 1 (SD 3).

4. Ask students to evaluate the health of this deer population. Have students speculate on causes of increases and decreases. Populations that increase after a decrease are considered healthy.
   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 Deer Population 1 is probably not 'healthy,' since it seems to be in steady decline.

5. Project Deer Population 2 (SD 4).

6. Ask students to evaluate the health of this deer population. Have students speculate on causes of increases and decreases. Why was the decrease followed by an increase?

Procedure cont.

7. Why was the decrease followed by an increase?
   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.

8. Project Actual Population (SD 5).

9. Explain to the class that this graph represents an actual population of real organisms.

10. Ask students what they notice.
    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.

11. Ask students what they think will happen in the future.
    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.)

12. Project Actual Population – with dates (SD 6)

13. Explain that this is a graph of the population of human beings on Earth.

14. Ask students what they notice.
    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 SD 5, 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.

Procedure cont.

15. 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?"
These are obviously controversial ethical issues. This is a good chance to talk through these kinds of issues with students.
Possible responses:
- Limit the number of childbirths.
- Don't cure all diseases.
- Don't intervene in famine.
Use the following questions on human experience to continue the discussion.
- Is population growth faster in countries where 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?

Formative Assessment/ Guided Practice

1. Hand each student a copy of SD 7 and a sheet of graph paper or a copy of SD 2.
2. Have them complete the assignment.
Possible Answers:
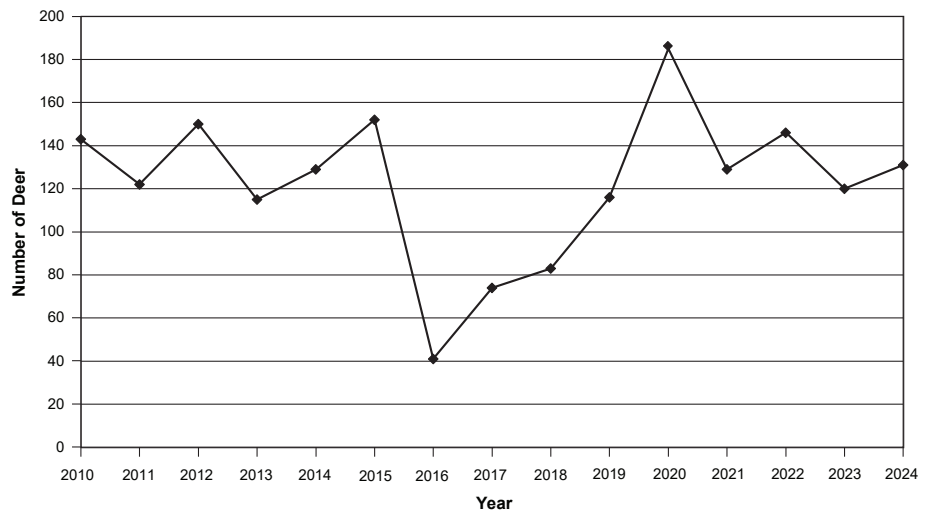
- This is probably a healthy population, with fairly regular decreases followed by increases.
- Students should have some reasonable explanation for the sharp decrease between 2015-2016. For example:
  o Drought.
  o Disease.
  o Forest fire.
- Evidence of long-term health is that the population rebounded so quickly after 2016

SD 1

Tally Sheet for Oh Deer!

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

SD 2   Oh Deer! – Graph, blank

Number of deer
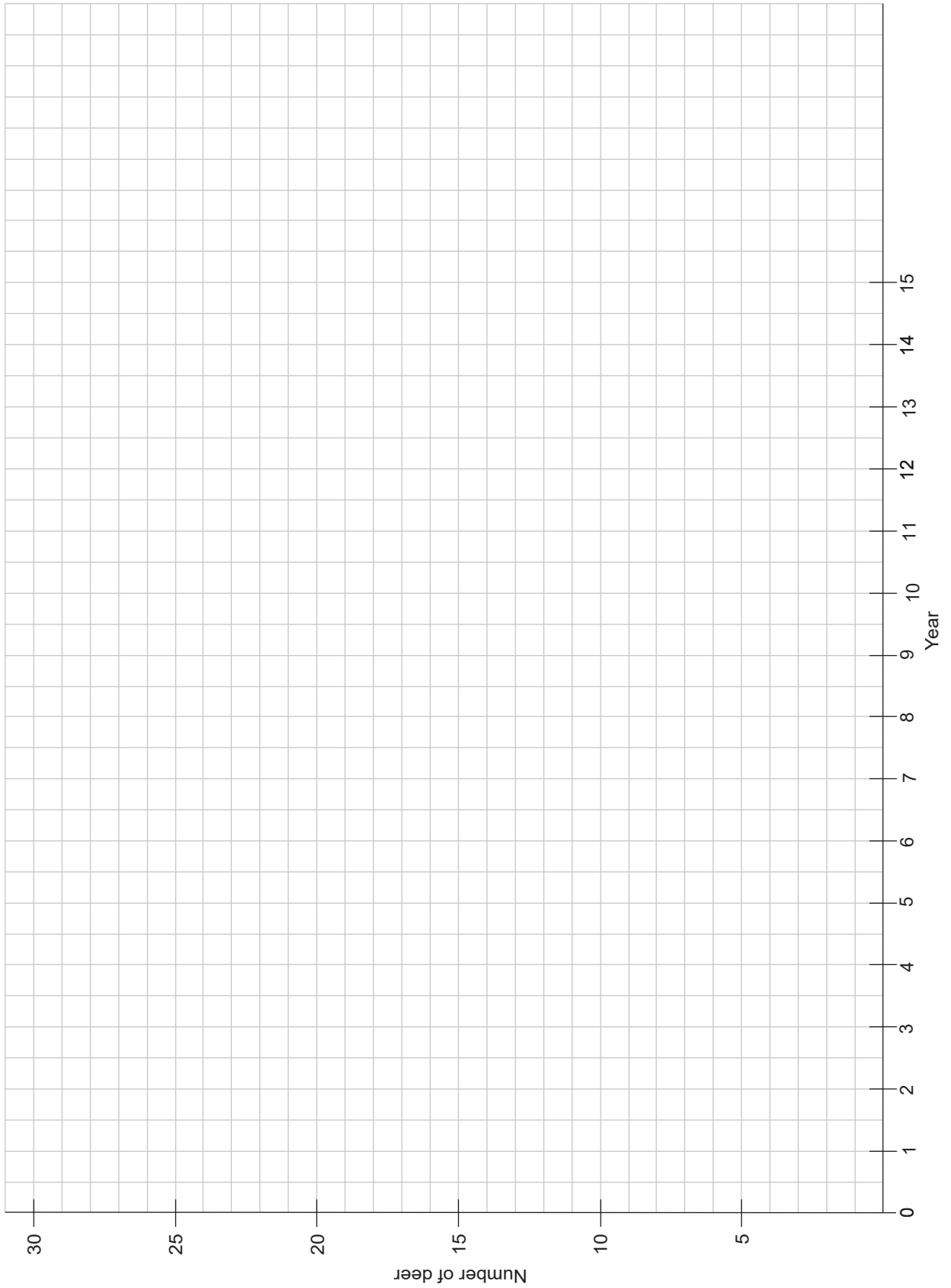
Year

SD 3

Deer Population 1

Year	Population
2010	121
2011	165
2012	154
2013	110
2014	81
2015	63
2016	68
2017	77
2018	59
2019	41
2020	42
2021	55
2022	43
2023	37
2024	33
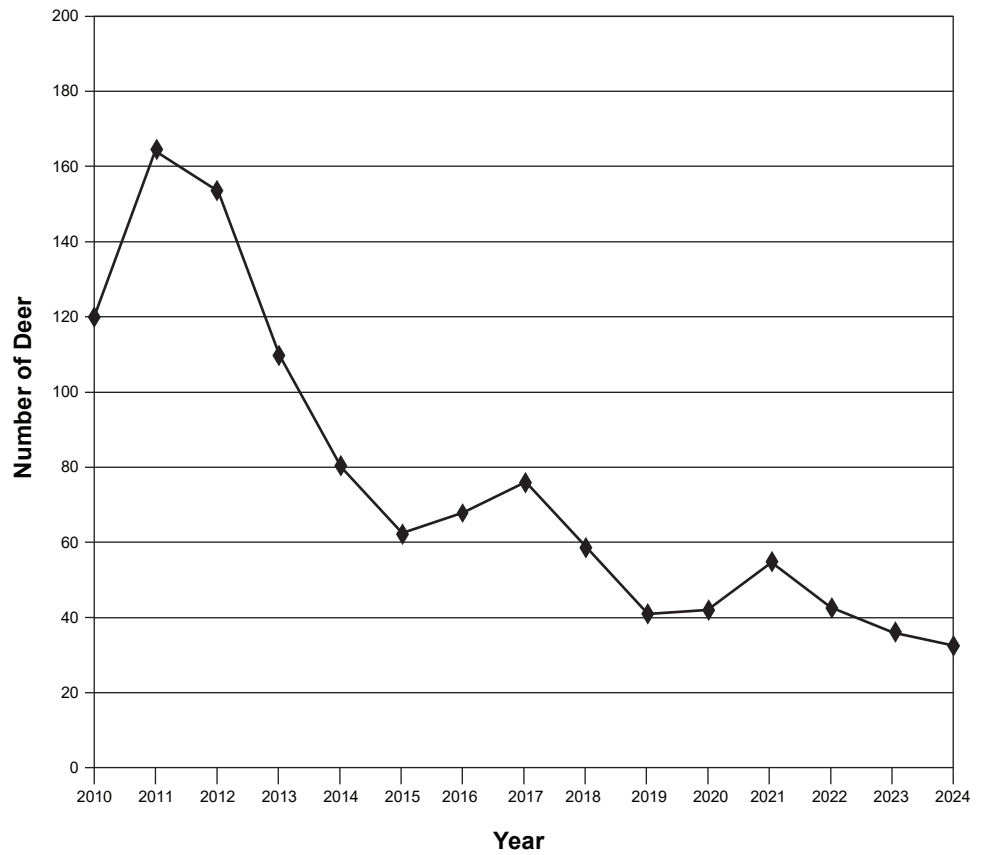
SD 4

Deer Population 2

Year	Population
2010	119
2011	103
2012	114
2013	86
2014	63
2015	68
2016	35
2017	14
2018	24
2019	42
2020	51
2021	83
2022	121
2023	130
2024	128

SD 5

Actual Population

Population Size — Date

year A | year B | year C | year D | year E | year F | year G | year H

SD 6   Actual Population – with dates"

Population Size (y-axis): 7 billion, 6 billion, 5 billion, 4 billion, 3 billion, 2 billion, 1 billion

Date (x-axis): 70,000 · 60,000 · 50,000 · 40,000 · 30,000 · 20,000 · 10,000 · BCE · 2000 · CE
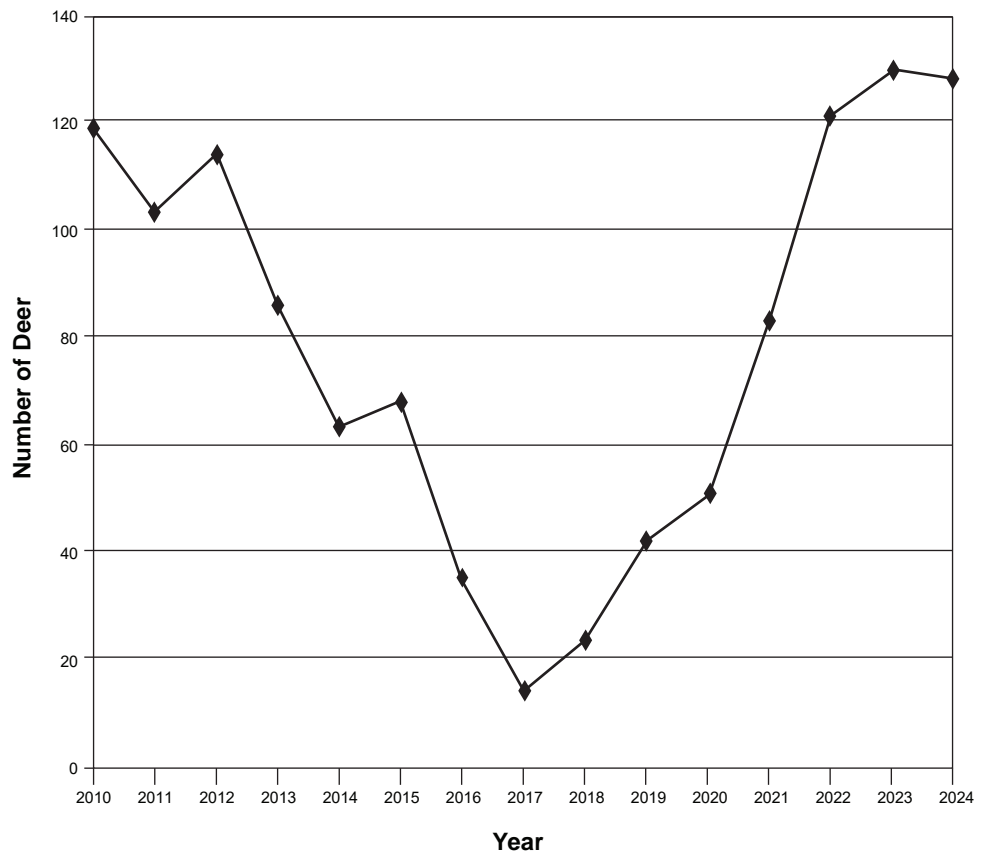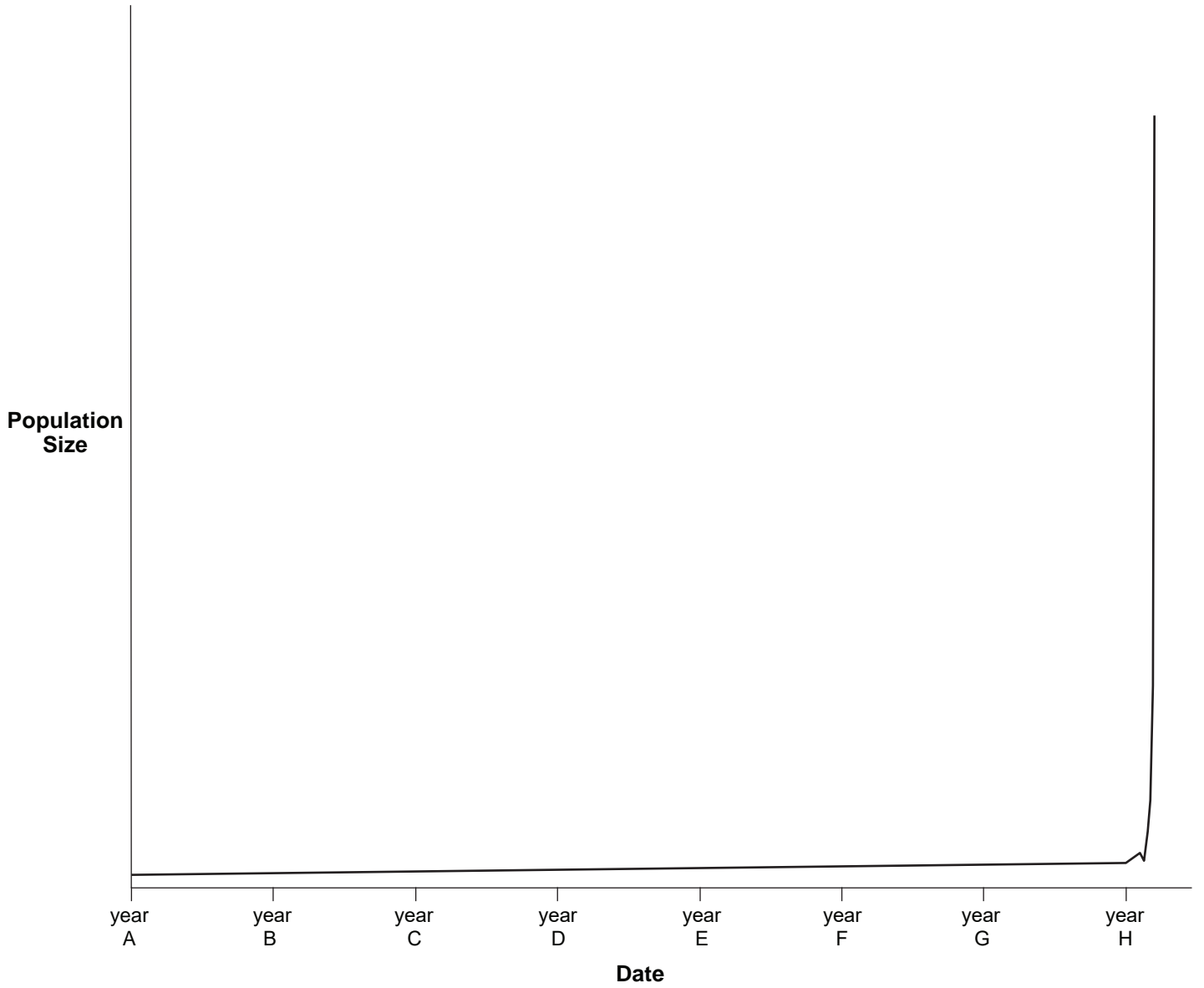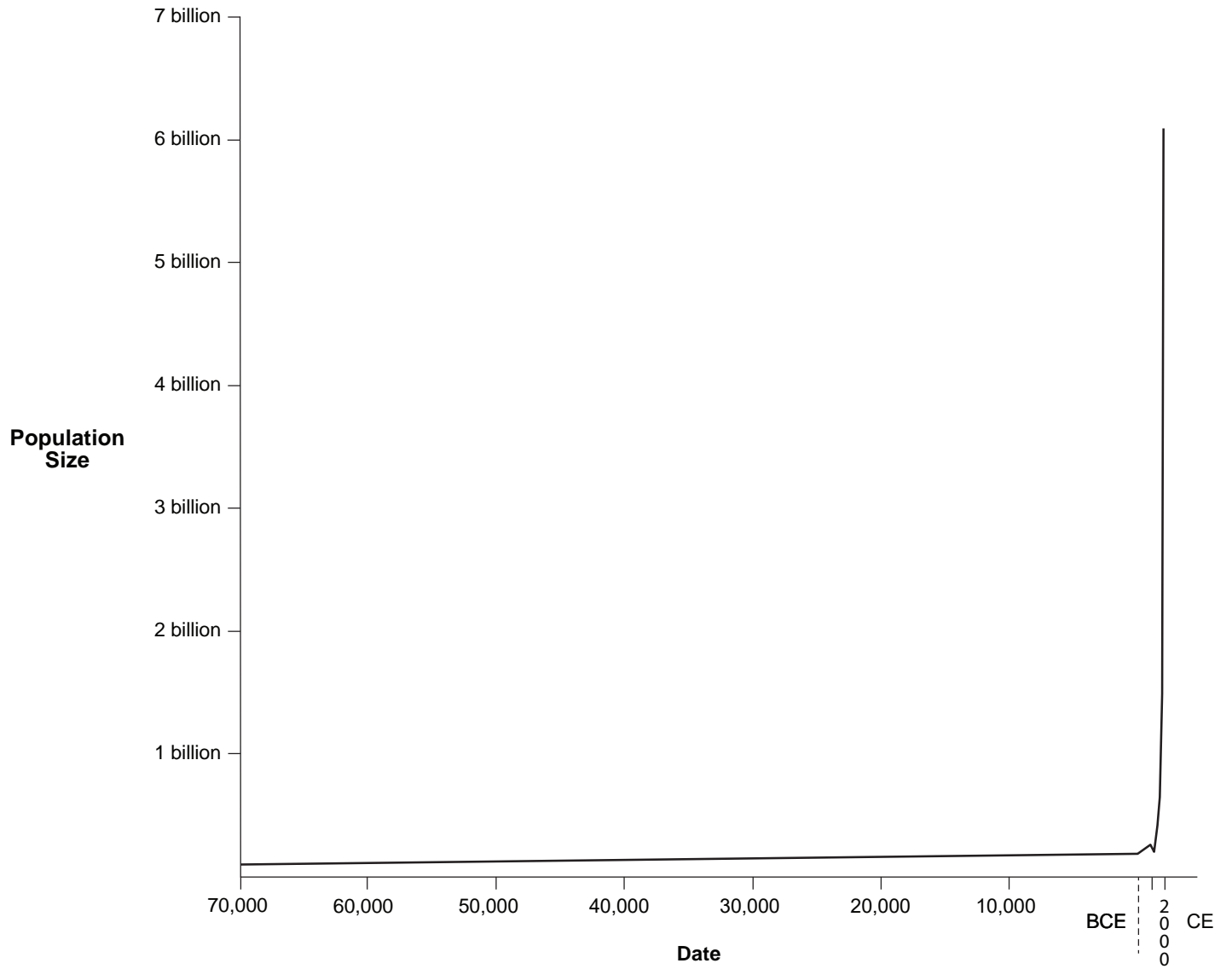
SD 7   Carson County

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

Year	Population
2010	143
2011	122
2012	150
2013	115
2014	129
2015	152
2016	41
2017	74
2018	83
2019	116
2020	185
2021	129
2022	146
2023	120
2024	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 is sues:

- 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.