

Lab Framework

Text:Cord

Unit number and title: Unit 12 Scientific Notation

Short Description: This lab is a moving activity for students to simulate population trends in herd of deer. This activity is best done in a gym or outside and then move to the classroom to compile data and develop trends. This is adapted for an application of population measurements expressed in scientific notation.

Developed by: Jennie Wagner/adaptation of Project Wild activity

Contact Information: jwagner@mlsd.org or jenniejowagner@msn.com

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Lab Title Oh Deer!

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lab Objective**

A variety of factors affects the ability of wildlife to successfully reproduce and maintain their populations over a period of time. Among these factors include resource availability, disease, predator/prey relationships, varying impacts of weather conditions, accidents, environmental pollution, and habitat destruction and degradation. Some **limiting factors** serve to prevent wildlife populations from reproducing in numbers greater than their habitat can support, or **carrying capacity**. An excess of such limiting factors, however, leads to threatening, endangering, and eliminating whole species of animals. The most fundamental of life's necessities for any animal are food, water, shelter and space in suitable arrangements. Without these essential resources, animals cannot survive. At the end of the lab, students will determine if this is a situation where numbers could be expressed in scientific notation.

- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)

- 1) follow directions and work in a group
- 2) basic calculator operation
- 3) use basic computation skills
- 4) graphing of data and recording data in a table

- **Vocabulary**

Limiting factors: basic needs that are not available or in short supply

Carrying Capacity: how many animals a habitat can support

Exponential population growth: population growth not limited by habitat factors but dependent upon number of individuals potential net reproduction rate.

Lag phase: period of no growth

Logistic growth: growth rates slow or stop after a period of exponential growth.

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- **Materials List**

Shoes/clothes to easily move in, football field (or other appropriate space), graph paper, your immense creativity and intellectually superior scientific mind.

- **State Standards addressed**

Math: A1.1.E Solve problems that can be represented by exponential functions and equations. (Partial)

A1.2.D Interpret and use integer exponents and square and cube roots, and apply the laws and properties of exponents to simplify and evaluate exponential expressions. (Partial)

A1.6.A Use and evaluate the accuracy of summary statistics to describe and compare data sets.(Partial)

Reading: Understand and Use vocabulary (word meaning) strategies to comprehend text. apply content/academic vocabulary critical to the meaning of the text, including vocabularies relevant to different contexts, cultures, and communities.

Writing: Write for different purposes, such as telling stories, presenting analytical responses to literature, persuading, conveying technical information, completing a team project, and explaining concepts and procedures.

- **Leadership Skills**

1.6 The student will conduct self in a professional manner in practical career applications, organizational forums, and decision-making bodies.

2.1 The student will communicate, participate, and advocate effectively in pairs, small groups, teams, and large groups in order to reach common goals

- **SCAN Skills/Workplace Skills**

1.2 The student will demonstrate the ability to acquire and use **information** in a family, community, business and industry settings. This means that the student can acquire and evaluate data, organize and maintain files, interpret and communicate, and use computers to process information.

1.3 The student will demonstrate an understanding of complex inter-relationships (**systems**). This means that the student understands social, organizational, and technological systems; they can monitor and correct performance; and they can design or improve systems

- **Set-up information**

Procedures:

1. Students will count off in fours.
2. The “ones” will all stand on the 50 yard line and be playing the part of the "deer". Everyone else will stand on the 30 yard line and they will represent food, water and shelter. Both sides will stand with their backs to the students on the other line.

3. Before the teacher begins the first round the students must determine which sign they will use (**circle which role you played in this lab**):

<u>Deer Signs</u>	<u>Habitat Resource Signs</u>
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<p>THIRSTY (looking for water) = hands over mouth</p> <p>HUNGRY (looking for food) = hands over stomach</p> <p>SHELTER (looking for home) = hands over head</p>	<p>WATER = hands over mouth</p> <p>FOOD = hands over stomach</p> <p>SHELTER = hands over head</p>
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4. At the beginning of each round we will record the total population of deer.
5. At the teacher's signal the students will turn to face the other team. ***In order for this to be an effective activity students must be honest. In other words, the deer that decide to be in search of food must continue to search only for food. Procedural warning: **you may not change what you are looking for.**
6. If a deer is unable to locate the resource it is looking for that deer dies and the student joins the side of the habitat resources. Conversely, if a habitat resource is captured by a deer that student joins the deer population. This represents the ability of the deer to reproduce.
7. After 20 rounds (each round representing a year) we will return to the classroom and you will be expected to graph our results.

- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline required**)

See above procedures

- **Teacher Assessment of student learning** (scoring guide, rubric)

Analysis of below products Data Analysis:

On your graph, you will have to correctly label the graph (good quality title, x-axis and y-axis with appropriate units), use a proper scale, and identify our habitat's lag phase, exponential growth phase and carrying capacity. Please make sure you attach the graph paper to your lab report.

1. What are the resources available to the deer in this lab?
2. What are some other resources that deer would need to survive in the wild?
3. What is exponential growth? What is logistic growth?
4. What limited the growth of the deer population in the lab?
5. What is a population's lag phase?
6. What is the carrying capacity for the deer population according to your graph?
7. Once the deer population goes significantly above carrying capacity, describe what happens to the deer population in the years following.

Conclusion:

1. Write a brief explanation of how you determined the carrying capacity, as well as a description of how the activity modeled the significance of limited resources in regards to a species' population.
2. Error analysis (list some possible sources of errors and how they could affect the lab results).
3. Suggestions for improving the lab to make the simulation more accurate and effective

- **Summary of learning** (to be finished after student completes lab)
 - discuss real world application of learning from lab – what other populations could be studied in this manner.

-ask students to explain how scientific notation would simplify the data collection, tabulation and reporting process.

-opportunity for students to share/present learning

Students will present their graphs and conclusions about populations, analyze errors and suggest improvements to lab process.

- **Optional activities**

Could be adapted to study any population such as the current BP oil spill, or a localized population trend in a species.

- **Career Applications**

Wildlife biologist, environmental scientist, statistician

SEE ATTACHED LAB SHEET FOR STUDENTS BELOW.

Applied

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<https://wa-appliedmath.org/>

Oh Deer!

Resources & Population Simulation

Purpose: _____

Background: A variety of factors affects the ability of wildlife to successfully reproduce and maintain their populations over a period of time. Among these factors include resource availability, disease, predator/prey relationships, varying impacts of weather conditions, accidents, environmental pollution, and habitat destruction and degradation. Some **limiting factors** serve to prevent wildlife populations from reproducing in numbers greater than their habitat can support, or **carrying capacity**. An excess of such limiting factors, however, leads to threatening, endangering, and eliminating whole species of animals. The most fundamental of life's necessities for any animal are food, water, shelter and space in suitable arrangements. Without these essential resources, animals cannot survive.

Hypothesis: None

Control/Variables: Control group: none
 Manipulated variable (independent): resource availability
 Responding (dependent): ?

Materials: Shoes/clothes to easily move in, football field (or other appropriate space), graph paper, your immense creativity and intellectually superior scientific mind.

Procedures:

8. Students will count off in fours.
9. The “ones” will all stand on the 50 yard line and be playing the part of the "deer". Everyone else will stand on the 30 yard line and they will represent food, water and shelter. Both sides will stand with their backs to the students on the other line.
10. Before the teacher begins the first round the students must determine which sign they will use (**circle which role you played in this lab**):

<u>Deer Signs</u>	<u>Habitat Resource Signs</u>
THIRSTY (looking for water) = hands over mouth	WATER = hands over mouth
HUNGRY (looking for food) = hands over stomach	FOOD = hands over stomach
SHELTER (looking for home) = hands over head	SHELTER = hands over head

11. At the beginning of each round we will record the total population of deer.
12. At the teacher’s signal the students will turn to face the other team. ***In order for this to be an effective activity students must be honest. In other words, the deer that decide to be in search of food must continue to search only for food. Procedural warning: **you may not change what you are looking for.**
13. If a deer is unable to locate the resource it is looking for that deer dies and the student joins the side of the habitat resources. Conversely, if a habitat resource is captured by a deer that student joins the deer population. This represents the ability of the deer to reproduce.
14. After 20 rounds (each round representing a year) we will return to the classroom and you will be expected to graph our results.

Data Collection:

Year	Deer population	Year	Deer population	Year	Deer population	Year	Deer population
1		6		11		16	
2		7		12		17	
3		8		13		18	
4		9		14		19	
5		10		15		20	

Data Analysis:

On your graph, you will have to correctly label the graph (good quality title, x-axis and y-axis with appropriate units), use a proper scale, and identify our habitat's lag phase, exponential growth phase and carrying capacity. Please make sure you attach the graph paper to your lab report.

8. What are the resources available to the deer in this lab?
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4. Write a brief explanation of how you determined the carrying capacity, as well as a description of how the activity modeled the significance of limited resources in regards to a species' population.
5. Error analysis (list some possible sources of errors and how they could affect the lab results).
6. Suggestions for improving the lab to make the simulation more accurate and effective.

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