NUTRIA

And the Disappearing Marsh

TEACHER

Activity Overview

Nutria are large rodents associated with the loss of marshes in Louisiana's wetlands. This species was introduced in Louisiana in the late 1930s for their valuable fur. Nutria contribute to wetland loss through a process known as *eat out*. Eat out occurs when animals feed on plant roots and the lower portions of plant stems and in so doing break up the roots. Plant roots hold soil together and slow down erosion. After an eat out, plants and soil are washed away when the marsh floods because there are no roots to hold them in place. A hole is left in the marsh. What was once land now becomes open water.

In this activity, students will examine changes in the nutria population, vegetation density, and marsh area over time. Students will use data based on the Nutria-Marsh Loss Model created by Dr. Jacoby Carter, a scientist at the USGS National Wetlands Research Center. Students will import data and use the TI-73 Explorer™ to graph and analyze the effects of nutria on marsh loss.

Conclusions: Increases in the number of nutria cause a decrease in the vegetation density. A decrease in vegetation density can result in marsh loss when floods wash away loose soil.

Activity at a Glance

Grade:	6–9
Subject:	Science
Category:	Life Science, Earth Science
Topic:	Ecology, Plants, Animals, Living Things, Erosion

Time Required

- Two 45-minute periods

Level of Complexity

- Medium

Materials*

- TI-73 Explorer™

TI-73 Explorer™

Concept Background

- Nutria feed on the roots and stems of plants. Often, they gnaw at and destroy more plants than they can eat. It is estimated that as they search for food, they destroy 10 times more plant matter than they actually consume.
- In Louisiana, nutria have been associated with the loss of brackish and freshwater marshes because of a process known as eat out. Eat out occurs when nutria feed on plant stems and break up the root mat by grubbing for plant roots. The plant roots hold soil together and slow down erosion. During subsequent periods of high water, the soil may be washed away, leaving a hole in the marsh.
- Plant roots hold together marsh soil and help stabilize the marsh. A high density of plants and roots prevents soil erosion and marsh loss during floods.
- Nutria do not directly consume marsh. They contribute to marsh loss by consuming vegetation in a marsh. The loss of vegetation results in an increase in erosion during floods.

Preparation and Classroom Management Tips

- You will need to import the nutria data using the TIDataEditor. Once imported, the data can be transferred to student calculators by following the steps in the student activity. To import the data, use the following steps:

  1. **Download and install TI Connect™ to your computer.**
     a. Go to http://education.ti.com/us/product/accessory/connectivity/down/download.html.
     b. Follow directions to download the software installer to your computer.
     c. Double-click the installer and follow the directions to set up TI Connect™.

  2. **Download the data file (NUTRIA.73g or NUTRIATI83.83g) and transfer the data from the computer to your calculator.**
     Note: If you are using a TI-73 Explorer™ use the data file NUTRIA.73g. If you are using the TI-83 or TI-84 family of calculators use the data file NUTRIATI83.83g.
     a. Go to http://education.ti.com/educationportal/activityexchange/activity_list.do?cid=us
     b. Download the data file to your computer.
     c. Connect the computer and your calculator with the TI Graph Link cable.
     d. Drag the data file and drop it on the TI Connect icon which is installed on your desktop.

- Vegetation density is measured in kg per hectare (ha). The values listed in the data are vegetation density divided by 100. This allows students to view nutria population, vegetation density, and marsh area data on one graph.
- Marsh area is measured in hectares. A hectare is 100 m x 100 m.
- This activity works well with students working in groups, or as a demonstration.
- Encourage students to answer the questions in Data Analysis in their journals.
- Create your own student questions for use on your students' TI graphing devices using the Texas Instruments StudyCard applications. For more information, go to http://education.ti.com/us/product/apps/studycards/scresources.html.

National Education Standards

Science Standard A: Science As Inquiry

Students should understand scientific inquiry and develop abilities necessary to perform it.

Science Standard B: Physical Science

Students should develop an understanding of properties and changes in matter, motions and forces, and transfer of energy.

Science Standard C: Life Science

Students should develop an understanding of the structure and function of living systems, regulation and behavior, and populations and ecosystems.

Math Standard: Data Analysis & Probability

Students should develop an understanding about how to collect, organize, display, and interpret data.

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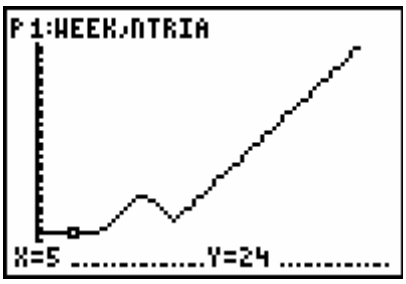
Part B — Examine Changes in Nutria Population over Time

Data Analysis



1 Q. Describe the change in the number of nutria over time.

A. Initially there was no change in the number of nutria. The number of nutria then increased followed by a slight decrease. Finally, the number of nutria increased steadily. Overall, there was an increasing pattern in the nutria population.

2 Q. Which week(s) had the greatest number of nutria?

A. The week with the greatest number of nutria was Week 47.

3 Q. Which week(s) had the least number of nutria?

A. The weeks with the least number of nutria were Week 1 through Week 9.

4 Q. During which time period(s) did the number of nutria decrease?

A. The number of nutria decreased between Week 16 and Week 20.

5 Q. During which time period(s) did the number of nutria increase?

A. The number of nutria increased between Week 10 and Week 15 and between Week 21 and Week 47.

Vocabulary

Abiotic Nonliving**.**

Biotic Living or pertaining to life.

Channel A path through a body of water that is deeper than the surrounding water**.**

Consumer An organism that must eat other organisms for energy.

Decomposer An organism that breaks down dead matter.

Density The mass of a substance divided by its volume.

Detrital Cycle The process through which decaying plant or animal matter is broken down and the nutrients it contains are returned to the surrounding system.

Eat Out The removal of marsh vegetation by plant-eating animals, which leave a hole in the marsh.

Ecosystem A community of living things in their environment.

Estuary An area where freshwater and saltwater mix; a coastal region that forms where the river meets the sea.

Food Chain The order of organisms through which energy passes from producers to consumers in an ecosystem.

Hydric Having excessive moisture; a condition of soil that is continuously wet and therefore oxygen-poor.

Marsh A wetland that contains grasses and low-lying plants.

Organism A living thing.

Producer An organism that makes its own food.

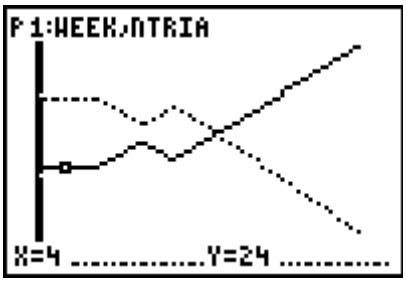
Salinity A measurement of the amount of salt dissolved in water.

Saltwater Intrusion The process by which saltwater moves inland toward freshwater environments.

Swamp A wetland that has trees.

Part C — Examine Changes in Vegetation Density over Time

Data Analysis



1 Q. Describe the change in vegetation density over time.

A. Vegetation density initially remained constant but then decreased. A slight increase in vegetation density was followed by a large steady decrease. Overall, there was a decreasing pattern in vegetation density.

2 Q. Which week(s) had the greatest vegetation density?

A. Week 1 through Week 9 had the greatest vegetation density.

3 Q. Which week(s) had the least vegetation density?

A. Week 47 had the least vegetation density.

4 Q. During which time period(s) did the vegetation density increase?

A. The vegetation density increased between Week 16 and Week 20.

5 Q. During which time period(s) did the vegetation density decrease?

A. The vegetation density decreased between Week 10 and Week 16 and between Week 21 and Week 47.

6 Q. What happened to vegetation density when the number of nutria increased?

A. When the number of nutria increased, vegetation density decreased.

7 Q. What happened to vegetation density when the number of nutria decreased?

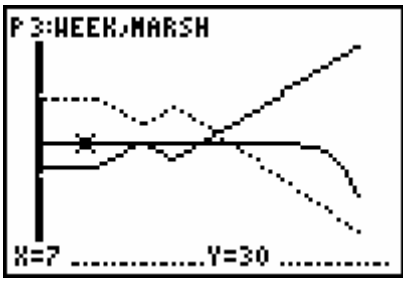
A. When the number of nutria decreased, vegetation density increased.

8 Q. What happened to vegetation density when there was no change in the number of nutria from one week to the next?

A. When there was no change in the number of nutria from one week to the next, the vegetation density did not change.

Part D — Examine Changes in Marsh Area over Time

Data Analysis



1 Q. Describe the change in the marsh area over time.

A. Marsh area did not change for the first 33 weeks but then there was a rapid decrease in marsh area.

2 Q. Which week(s) had the greatest marsh area?

A. Marsh area was greatest from Week 1 through Week 33.

3 Q. Which week(s) had the least marsh area?

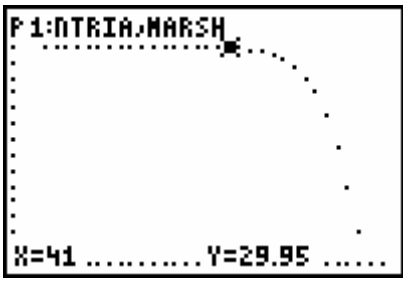
A. Week 47 had the least marsh area.

4 Q. A flood occurred during the time period displayed on the graph. Based on your data and the information in the research article, during which week did the flood occur? Explain.

A. The flood started during Week 34. During this week the marsh area started to decline. During the weeks prior to this flood, nutria had been eating the plants and roots that held soil in place. However, marsh area was not lost until the marsh flooded. When the marsh flooded, marsh area was lost as soil washed away because there were no roots to hold the soil in place.

Part E — Examine the Relationship between Nutria Population and Marsh Area

Data Analysis



1 Q. Describe the relationship between nutria population and marsh area.

A. Initially, there was no change in marsh area as the number of nutria increased. After 41 nutria, the relationship changed to a decrease in marsh area as the number of nutria increased.

2 Q. What was the nutria population when the marsh area started to decrease?

A. The marsh area started to decrease when the nutria population was 41.

3 Q. According to your graph, as nutria population increased, there was no initial change in marsh area. Based on the information in the research article, why do you think marsh area did not change immediately?

A. The marsh area did not change because a flood did not occur to wash away soil. An eat out was in process but a flood was needed to have an impact on marsh area.

4 Q. Scientists have found each nutria requires 96.25 kg of vegetation per week. Use your calculator to find the total vegetation consumed by the number of nutria in Week 4.

A. The total vegetation consumed by 24 nutria in Week 4 was 2310 kg.

5 Q. Considering your answer to Question 4, why didn't the vegetation density decrease from Week 4 to Week 5?

A. The vegetation density did not decrease from Week 4 to Week 5 despite consumption by nutria because vegetation was growing. During these weeks, the growth of new vegetation was equal to the loss from nutria consumption.