

And the Disappearing Marsh

ACTIVITY



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

How does nutria population change over time? How does vegetation density change over time? What is the impact of nutria on marshes?

Focus Question

What is the impact of nutria on marshes?



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Part A — Transfer the Nutria, Vegetation, and Marsh Area Data to your TI-73 Explorer™

Procedure

1 Reset the TI-73 Explorer™ to the default settings.

- a. Turn on the TI-73 Explorer™.
- b. Press **2nd** [MEM] **7** **2** **2**.
- c. Press **2nd** [MEM] **6** [ENTER].

2 Transfer the data to your TI-73 Explorer™.

- a. Turn on the TI-73 Explorer™ without the data.
- b. Use the link cable to connect the TI-73 Explorer™ without the data to the TI-73 Explorer™ with the data.
- c. Make sure both graphing devices are turned on.

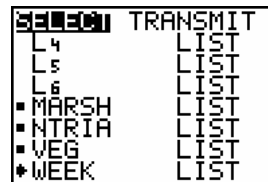
TI-73 Explorer™ without data.

- a. Press **APPS** to display the APPLICATIONS MENU.
- b. Select 1:Link and press **▶** to display the LINK RECEIVE MENU.
- c. Select 1:Receive. The message “Waiting...” and the busy indicator are displayed. The receiving unit is ready to receive the data.



TI-73 Explorer™ with data.

- a. Press **APPS** to display the APPLICATIONS MENU.
- b. Select 1:Link to display the LINK SEND MENU.
- c. Select 4:List to display all the data items (see Key below). Press **▲** and **▼** to move the selection cursor (E) to each data item for the data (MARSH, NTRIA, VEG, and WEEK) and press **ENTER** to select each item. Once selected the items will be marked with a black box (■).
- d. Press **▶** to display the TRANSMIT MENU.
- e. Select 1:Transmit. The name of each data item is displayed line by line on the sending unit as the item is sent, and on the receiving unit as each item is received.



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Materials*

- TI-73 Explorer™



TI-73 Explorer™



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Part B — Examine Changes in Nutria Population over Time

Procedure

1 Make a graph of nutria and weeks.

- a. Press **2nd** [PLOT].
- b. Press **1** to define Plot1.



- c. Turn Plot1 on by pressing **ENTER**.
- d. Press **↓** **↓** **ENTER** to select LINE GRAPH (↖↗).
- e. Set the Xlist. Press **↓** **2nd** [STAT], scroll down to WEEK using **↓**, and press **ENTER**.
- f. Set the Ylist. Press **↓** **2nd** [STAT], scroll down to NTRIA using **↓**, and press **ENTER**.
- g. Press **↓** **↓** **↓** **ENTER**.
- h. Press **GRAPH**.
- i. Press **ZOOM** **7** to adjust the scale on your graph.



2 Complete the Data Analysis section. Answer the questions in your journal.

Data Analysis

While observing the graph, press **TRACE** and use the arrow keys (**↓** and **↑**) to move the cursor along a line. The X-coordinate and Y-coordinate of each data point are displayed below the graph.

Make a sketch of your graph in your journal and label it *Change in Nutria*. Answer questions 1–5 in your journal by observing your graph.

- 1** Describe the change in the number of nutria over time.
- 2** Which week(s) had the greatest number of nutria?
- 3** Which week(s) had the least number of nutria?
- 4** During which time period(s) did the number of nutria decrease?
- 5** During which time period(s) did the number of nutria increase?



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Part C — Examine Changes in Vegetation Density over Time

Procedure

The density of vegetation is reported in units of kilograms per square hectare (ha). A hectare is 100 m x 100 m or 10,000 m². To allow vegetation density to be plotted on the same graph as nutria and marsh area, vegetation density was divided by 100. The vegetation density listed in your data has been reduced by this factor. To find the actual vegetation density, multiply the value listed by 100. For example, a vegetation density of 40.2 kg per ha in your data is actually 4020 kg per ha.

1 Make a graph of vegetation density and weeks.

- a. Press **2nd** [PLOT].
- b. Press **2** to define Plot2.
- c. Turn Plot2 on by pressing **▾** [ENTER].
- d. Press **▾** **▸** [ENTER] to select LINE GRAPH (↗).
- e. Set the Xlist. Press **▾** **2nd** [STAT], scroll down to WEEK using **▾**, and press [ENTER].
- f. Set the Ylist. Press **▾** **2nd** [STAT], scroll down to VEG using **▾**, and press [ENTER].
- g. Press **▾** **▸** [ENTER].
- h. Press [GRAPH].
- i. Press **ZOOM** **7** to adjust the scale on your graph.



2 Complete the Data Analysis section. Answer the questions in your journal.

Data Analysis

While observing the graph, press **TRACE** and use the arrow keys (**↓** and **←**) to move the cursor along a line. The X-coordinate and Y-coordinate of each data point are displayed below the graph. Use the up and down arrow keys (**↑**, **↓**) to move the cursor from one curve to the next.

Make a sketch of your graph in your journal and label it *Change in Vegetation Density*. Answer questions 1–8 in your journal by observing your graph.



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- 1 Describe the change in vegetation density over time.
- 2 Which week(s) had the greatest vegetation density?
- 3 Which week(s) had the least vegetation density?
- 4 During which time period(s) did the vegetation density increase?
- 5 During which time period(s) did the vegetation density decrease?
- 6 What happened to vegetation density when the number of nutria increased?
- 7 What happened to vegetation density when the number of nutria decreased?
- 8 What happened to vegetation density when there was no change in the number of nutria from one week to the next?

Part D — Examine Changes in Marsh Area over Time

Procedure

Marsh area is reported in units of hectares (ha). A hectare is 100 m x 100 m or 10,000 m².

1 Make a graph of marsh area and weeks.

- a. Press **2nd** [PLOT].
- b. Press **3** to define Plot3.
- c. Turn Plot3 on by pressing **▼ ▼ ENTER**.
- d. Press **▼ ▸ ENTER** to select LINE GRAPH (↗).
- e. Set the Xlist. Press **▼ 2nd** [STAT], scroll down to WEEK using **▼**, and press **ENTER**.
- f. Set the Ylist. Press **▼ 2nd** [STAT], scroll down to MARSH using **▼**, and press **ENTER**.
- g. Press **▼ ENTER**.
- h. Press **GRAPH**.
- i. Press **ZOOM** **7** to adjust the scale on your graph.



2 Complete the Data Analysis section. Answer the questions in your journal.



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Data Analysis

While observing the graph, press **TRACE** and use the arrow keys (**→** and **←**) to move the cursor along a line. The X-coordinate and Y-coordinate of each data point are displayed below the graph. Use the up and down arrow keys (**↑**, **↓**) to move the cursor from one curve to the next.

Make a sketch of your graph in your journal and label it *Change in Marsh Area*. Answer questions 1–4 in your journal by observing your graph.

- 1 Describe the change in the marsh area over time.
- 2 Which week(s) had the greatest marsh area?
- 3 Which week(s) had the least marsh area?
- 4 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.

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

Procedure

1 Make a graph of marsh area and nutria population.

- a. Press **2nd** **[PLOT]**.
- b. Press **4** **[ENTER]** to turn off Plot1, Plot2, and Plot3.
- c. Press **2nd** **[PLOT]**.
- d. Press **1** to define Plot1.
- e. Turn Plot1 on by pressing **[ENTER]**.
- f. Press **↓** **[ENTER]** to select SCATTER GRAPH (**⌈**).
- g. Set the Xlist. Press **↓** **2nd** **[STAT]**, scroll down to NTRIA using **↓**, and press **[ENTER]**.
- h. Set the Ylist. Press **↓** **2nd** **[STAT]**, scroll down to MARSH using **↓**, and press **[ENTER]**.
- i. Press **↓** **→** **→** **[ENTER]**.
- j. Press **[GRAPH]**.
- k. Press **[ZOOM]** **7** to adjust the scale on your graph.



2 Complete the Data Analysis section. Answer the questions in your journal.



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Data Analysis

While observing the graph, press **TRACE** and use the arrow keys (▶ and ◀) to move the cursor along a line. The X-coordinate and Y-coordinate of each data point are displayed below the graph.

Make a sketch of your graph in your journal and label it *Marsh Area vs. Nutria*. Answer questions 1–5 in your journal by observing your graph.

- 1** Describe the relationship between the nutria population and marsh area.
- 2** What was the nutria population when the marsh area started to decrease?
- 3** 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?
- 4** Scientists have found that 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.
- 5** Considering your answer to Question 4, why didn't the vegetation density decrease from Week 4 to Week 5?

