Habitat

Activity 1-5

We Are Losing Our Wetlands

Focus/Overview

Louisiana is losing our wetlands. We've all heard the numbers… sixteen square miles a year…. One football field every 30 minutes. Sometimes these numbers are hard to visualize. This lesson will have students figure out the total area (in square miles) of the Barataria-Terrebonne National Estuary, and how much of this area is now covered in water.

Learning Objectives

The learner will…

- measure the total area (in square miles and kilometers) of the Barataria-Terrebonne National Estuary.
- calculate the area (in square miles and kilometers) of the Barataria-Terrebonne National Estuary that is covered in water.

Louisiana Grade Level Expectations

3: GLE-58	Describe how humans have had negative and positive effects on organisms and their environments (SF-F-A5)
3: GLE-7 4: GLE-8	Measure and record … area in both metric system and U.S. system units (SI-E-A4)
3: GLE-46	Describe earth processes that have affected selected physical features in students' neighborhoods (ESS-E-A1)
4: GLE-63	Demonstrate and explain how Earth's surface is changed as a result of slow and rapid processes (ESS-E-A1, A5)

Materials List

Provide a list of supplies necessary to conduct the activity.

- BTNEP Estuary Map
- Construction paper and scissors for each student

BTNEP Connection
Habitat

Grade Level
3, 4

Duration
40 minutes.

Subject Area
science (with math)

Setting
classroom

Extension Areas
science, language arts

Vocabulary
subsidence, square mile, map key, legend

BTNEP
BARATARIA-TERREBONNE NATIONAL ESTUARY PROGRAM
www.btnep.org

Background Information

Historical photographs taken from the air and satellite images record the deterioration and loss of coastal wetlands in Louisiana. Those images tell us that between 1956 and 1978, the land loss rate was approximately 18 square miles a year. Between 1978 and 1988, that rate increased to 22 square miles a year. Between 1990 and 2000, the rate of land loss is still an astonishing 15 square miles a year.

When most people hear that Louisiana is losing our wetlands, they might think that the beaches are pushing back into the marsh. That is not correct. What actually is happening is that what was once healthy marsh is turning to open water as the land slowly subsides, or sinks, below the water table. You can see from the data in the table below that during the period from 1956 to 1988, open water within the Barataria-Terrebonne National Estuary increased by 16%, while areas covered by marsh fell by more than 19%.

Coverage of Major Habitat Types in Coastal Areas of the BTES

Habitat Type	*1956*	*1978*	*1988*
Open Water	42%	52%	58%
All Marsh Types	49%	37%	30%
Fresh marsh	--	9%	9%
Nonfresh marsh	--	28%	21%
Forested wetlands	6%	6%	6%

The BTES marshes are sinking through a process mentioned above, called **subsidence**. Subsidence is a natural process that all coastal sediments undergo. It involves sediments compacting and sinking under their own weight. Historically, annual floods over the banks of the Mississippi River and other smaller rivers and bayous provided sediment that kept the marshes above water. When the Mississippi River levee system was put in place (and there's been a levee along the Mississippi River ever since the first French settlers came to New Orleans back in the early 1800's) to protect coastal communities from annual flooding, the levees prevented the nourishing sediments from reaching the adjoining marshes. Subsidence drowns the marsh, causing chemical changes in the wetland soils that eventually kills the marsh grasses. Once the plants are dead, there is nothing to hold the drowning soil in place. The soils break up and are carried away, or eroded, due to wave action, leaving open water where once healthy marsh stood.

Other natural factors can cause the land loss problem to be even worse. Nutria, *Myocastor coypus*, an invasive species from South America, are herbivores and one of their favorite foods is marsh grass. Between 1993 and 2002, the Louisiana Wildlife and Fisheries Fur and Refuge Division estimates that nutria damage between 50,000 to 90,000 acres of marsh in the BT Estuary each year (Indicator Report, #17). Droughts, such as the one that occurred in 1999 and 2000 can cause problems too. It is suspected that this particular drought severely stressed marsh plants through out the BT Estuary, resulting in large tracts of marsh dying in a phenomenon dubbed the "brown marsh syndrome."

Among the human-induced factors that contribute to the land loss problem are water flow modifications, such as shipping canals, raised road beds, and the breaching of natural ridges. These activities interrupt the natural flow of water through the estuary. In the case of canals dug across the marsh to satisfy the needs of shipping and oil industry interests, the canals increase the ease with which salt water makes its way to interior freshwater marshes. Road beds built across the marsh, interrupt the ebb and flow of the tidal exchange.

A NOTE. A kilometer is a little over half a mile, so when converting miles to kilometers we should expect to get almost twice the number of kilometers. A square kilometer is than a square mile in area. It is less than half a square mile. If we remember these relationships then we are less likely to make gross arithmetic errors. The actual conversion factors are shown below in a table.

1 sq kilometer = 0.38610 sq miles
1 sq mile = 2.599 sq kilometers

Advance Preparation

Provide a list of supplies necessary to conduct the activity.

1. Have a copy of the BTNEP map available.
2. Make copies of the student guide sheet (**Blackline Master #1**)
3. Have construction paper available for students to use to during estimation exercise, or pre-cut XXX number of 16 square mile construction pieces.
4. Cut out a 1 square mile square construction paper that is keyed to the BTNEP map key.

Procedure

1. Show students a copy of the BTNEP map. This map shows an area that is 6,400 square miles in size. On a piece of paper, draw me how big a square mile is on this map. *(Have students draw what they think a square mile is on a piece of paper.)* Does anyone know where we can look to see how big a mile is on this map? *(Look at the scale bar in the map key.)* So, if this is how big one mile is, then we can get the size of a square mile by drawing a square that has this length on each side.
2. In the southern part of Louisiana, here in the Barataria-Terrebonne estuary, we are losing our wetlands. Every year, sixteen square miles of marsh is turning into open water. Who can tell me how we can draw a sixteen square mile area? *(Draw sixteen 1 square mile boxes side by side. Or, draw a 4 mile by 4 mile square.)* Let's draw a sixteen-mile square on our papers.
3. Today we are going to calculate how many square miles are in the Barataria-Terrebonne area. Together we will need to cut out approximately 400 of 4 mile square from their worksheet. (*You may want to divide students up into groups to make squares.)* We will need to lay our square of construction paper side by side until we have covered the entire map. *(You will need approximately*

400 square to cover the map. You can omit having students cut the squares out by having the 16 square mile pieces already cut out.) Alright, now how many 16 square mile pieces did we lay out across our map? *(Approximately 400)* So if each of our squares represents 16 square miles, does anyone know what we need to do to get our total area? *(Multiply the total number of square by 16.)* Notice on the map, there is another measurement scale besides miles. What is it? *(Kilometers.)* One of our 16 square mile pieces represents just over 40 square kilometers (41.3 km^2). Does anyone know how we can figure out how many square kilometers is within the Barataria-Terrebonne National Estuary? *(Yes. You multiply the number of square times we put on the map by the number 40. So there are approximately 16,000 square kilometers in the estuary, which is the same as 6400 square miles.)* The actual area of the estuary is 6,400 square miles or 16,576 square kilometers.

4. Much of the Barataria-Terrebonne National Estuary is covered by water. Let's take off all the squares that are lying on top land, and leave only those square that are one top of water. By doing this we can calculate how much of the Barataria-Terrebonne National Estuary is covered in water. To make our calculations more accurate, we are only going to put a 16 square mile piece on the map if half (or more) of the square is covered by water. *(This rule is necessary to get a more accurate count of the square miles covered by water. The area should be about 90 of the 16 square mile blocks)* Now let's calculate how many square miles within the estuary are covered by water. *(90 X 16mi^2 = 1,440 square miles)* How many kilometers would this be? *(90 X 40mi^2 = 3,600 square kilometers)*
5. So, today we learned that the Barataria-Terrebonne National Estuary covers a great deal of area on a map. Our measurements tell us that it is XXX square miles, and of this, XXX square miles are currently covered in water. Can anyone remember how many square miles of our marshes are turning into open water? *(That's right – 16 square miles.)* This land is being lost because we have put levees up along the Mississippi River, and the big river can no longer spread sediments over the marshes during spring floods to keep the marshes healthy. With no new sediments, the marsh land is slowly sinking – a natural process that geologists call **subsidence**. So until we can figure out new ways to get sediments back into the marsh land, we will continue to lose 16 square miles of land each year. That means that an area the size of one of these squares of land will subside (sink) and turn into open water.
6. So, in the next year, how many square miles of our marsh wetland will turn into open water? *(16 square miles.)* How many of our construction paper pieces do we need to remove to represent 16 square miles? *(1 piece)* [Remove a piece that covers either a small town or a portion of a road.] What would happen if we lost this particular sixteen square mile area? *(Either people would have to move or not drive to where that road leads. All the animals would have to find new homes… etc.)*
7. Losing our marshland to open water affects not only humans, but all animals that call the marsh home.

Blackline Master

1. **We Are Losing Our Wetlands**

Assessment

Give students a parish map and have them calculate how many square miles of water is found in their parish using the same strategies as in this lesson.

Extensions

Science:

1. Have students measure the square miles represented by coastal wetlands on the BTNEP map.
2. It is startling how fast we have lost our wetlands. This loss over time is especially apparent when you look at maps that have been taken over the last 50 years. Have students do activities from WETMAPP: Golden Meadow (available online at educators. btnep.org.

Language Arts:

1. Have students write an acrostic poem about the loss of the Louisiana marshes. Have students write the words LOST MARSH in a line down the left side of their paper. Each letter of LOST MARSH becomes the first letter in a word or a line of words describing our lost marshes.
2. Have students write a mystery story about the loss of Louisiana's wetlands.

Resources

BTNEP Resources:

BTNEP Thematic Map – Wall size
Indicator Report

Tradebooks:

Luenn, Nancy. 1994. **Squish! A Wetlands Walk.** Atheneum Books.

A feast for the senses, the author uses simple language to explain the benefits of wetlands. Young readers will gain a good understanding of the creatures and plants inhabiting the area, as well as an appreciation of the importance of wetlands and the need for their preservation. Reading level: Ages 4-8.

Gravois, Michael and Jim Palmer. 2001. **Comic Strip Map Skills.** Instructor Books.

30 reproducible cartoons with related maps and questions that build map skills. Reading level: Ages 9-13.

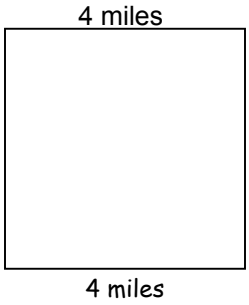
Sutcliffe, Andrea. 2002. **The New York Public Library Amazing US Geography: A Book of Answers for Kids.** Wiley.

Over two hundred questions and answers provide information about the climate, landforms, people, and places of the United States as a whole and of its different regions and states, including information on Louisiana and the Mississippi River. Reading level: Ages 9-12.

Blackline Master #1

We Are Losing our Wetlands Name _____

1. **It is estimated that Louisiana is losing nearly sixteen square miles (or 40 square kilometers) of land each year. That land is replaced with the Gulf of Mexico's water. To figure out how much sixteen square miles would look like, use the map scale the Barataria-Terrebonne National Estuary map to draw a line that would equal 4 miles. Then draw three more lines of the same length to form a square. The area of that square represents the amount of land that is lost each year through coastal erosion.**



2. **Using blue construction paper, cut out enough 4 mile by 4 mile squares as you need to cover the entire estuary. Be sure to place them side by side and not over lap them. Cover the entire surface of the map.**

   How many squares does it take to completely cover your map? _____

   How many square miles does that equal? _____
   (Remember, you will have to multiply 16 times the number of squares you used.)

   How many square kilometers does that equal? _____
   (Remember, you will have to multiply 40 times the number of squares you used.)

3. **Now calculate how much of the Barataria-Terrebonne estuary is covered in water by leaving squares on the map where water is present (lakes, bays, etc.)**

   How many squares does it take to completely cover the water your map? _____

   How many square miles of water does that equal? _____
   (Remember, you will have to multiply 16 times the number of squares you used.)

   How many square kilometers of water does that equal? _____
   (Remember, you will have to multiply 40 times the number of squares you used.)

QUESTIONS TO THINK ABOUT

Are we losing our wetlands in a perfect square?

What other ways could you draw a sixteen square mile area?

What are your thoughts about what you learned today?

Can you explain why our marsh land is turning into open water and why this is not a good thing?