Haunted Waters Fragile Lands

What Tales to Tell

7-12 Video Guide

1st Edition Editors:

John E. Trowbridge, Ph.D.
Southeastern Louisiana University

Connie H. Nobels, Ph.D.
Southeastern Louisiana University

Sharon Sledge
Illustrator

Barataria - Terrebonne
National Estuary Program

This educator's guide to the Haunted Waters video is currently being revised and updated. Louisiana State Grade Level Expectations will be added and the new version will be posted on the BTNEP Education website at http://educators.btnep.org/.

About this guide

The video, ***Haunted Waters Fragile Lands, Oh! What Tales to Tell*** was an immediate success when it was first produced in 1997. The education subcommittee of the citizens' advisory committee of the Barataria-Terrebonne National Estuary Program initiated the effort to produce a teacher's guide to enhance the classroom use of the video.

The video is formatted into four distinct sections; 1) Introduction, 2) Frontlands and Backlands, 3) Trembling Prairies, and 4) Life from the Water - Death from the Sea. These are natural breaks in the video that allow the teacher to stop and pursue activities or questions about that particular section. The complete guide has a section for elementary teachers (K-3), middle school teachers (4-6), and secondary school teachers (7-12). Each of these sections is available individually or you can download the complete video guide as a PDF document. You may wish to use materials from other sections based upon the abilities of your students and your preference for content.

The guide consists of strategies that can be done *before viewing* (pre-viewing activities and questions) the video to set foundations, evoke prior knowledge, and focus the student's attention. Next, are *viewing strategies* to help students target specific information from the video. Finally, there are *post-viewing* activities and lessons. We have included a reference section and will be adding additional appendices in the updated version.

We are continually open to comments or feedback. Please write or e-mall your thoughts about this guide. Comments can be sent to

Barataria Terrebonne National Estuary Program
Attn: Deborah Schultz
P.O. Box 2663
Thibodaux LA 70310

Acknowledgments

*The educator's guide to **Haunted Waters Fragile Lands, Oh! What Tales to Tell** is currently being updated and a new version will be posted on the BTNEP Education website during the 2004-2005 school year. Please check back at http://educators.btnep.org.*

The original production of this video guide was the result of many months of work. Many teachers contributed to this project by authoring lessons, field testing lessons, and reviewing drafts. Special thanks to Jean May-Brett, Tammy Nelson, Jeanne Windham, Kay Baggett, Jennifer Baggett, Amy Ory, and Lisa Kuebel for their contributions. It was a joy to have teachers such as them share their professional knowledge in producing this guide. We wish to thank Lynn Schonherg and the Barataria-Terrebonne National Estuary Program for allowing us this opportunity. The original version was first printed in 1997.

Video Guide: Grades 7-12

Video Section: *INTRODUCTION*

A. PREVIEWING ACTIVITIES AND QUESTIONS FOR *INTRODUCTION*

1. What is an ecological system?
2. List physical factors that you think affect the Barataria-Terrebonne estuary system.
3. List biological factors that you think affect the Barataria-Terrebonne estuary system.
4. What is a watershed or basin?
5. What is a tale?
6. Why do you think the waters of Barataria-Terrebonne estuary system could be called *haunted*?
7. Were there ever buffalo in Louisiana?

ACTIVITY: Mapping Identification of the Barataria-Terrebonne Estuary

Background

It is important that the students be aware that the Barataria-Terrebonne estuary system encompasses a large part of the state and includes a number of different places and habitats. Unfortunately hearing Barataria-Terrebonne often brings only the coastal area to mind. In fact the watershed covers thousands of square miles of farmland, forest and wetlands. An estuary is a transition zone where fresh water and salt water meet. Time period: One 50 minute class period.

Objectives

1. To identify the geographic area of the Barataria-Terrebonne estuary system
2. To describe the features of the Barataria-Terrebonne estuary system
3. To demonstrate map reading skills

Materials

- Louisiana state road map, State of Louisiana 1990 Topographic Map (series 1:500000) If you don't have a topographic map, visit Topozone at http://topozone.com an online source for topographic maps.
- Student worksheet, markers, string
- Overhead transparencies of the United States and Louisiana
- Wall map of the Barataria-Terrebonne estuary system

Procedure

1. Students should be arranged in appropriate cooperative groups.
2. Distribute the student worksheets (see following pages).
3. Set out maps at the materials pick up site.
4. Using the overhead illustration of the United States, the class should identify the Mississippi River system. The shape of a funnel may be outlined on the map to show how the river serves to drain the entire mid-section of the country. The state materials may then be used to illustrate the Mississippi-Atchafalaya system and how these rivers

empty into the Gulf of Mexico. Have students identify where the Barataria-Terrebonne system is located with respect to the Mississippi River and the Atchafalaya River.

Enrichment

1. Continued investigation of the basin using the GIS materials and the web sites.
2. Use other types of maps for example state soil maps or the geologic map to understand the role of the rivers in forming the state.

Vocabulary

contour	watershed	meander
oxbow lake	barrier island	

Map of the Mississippi River Drainage System.

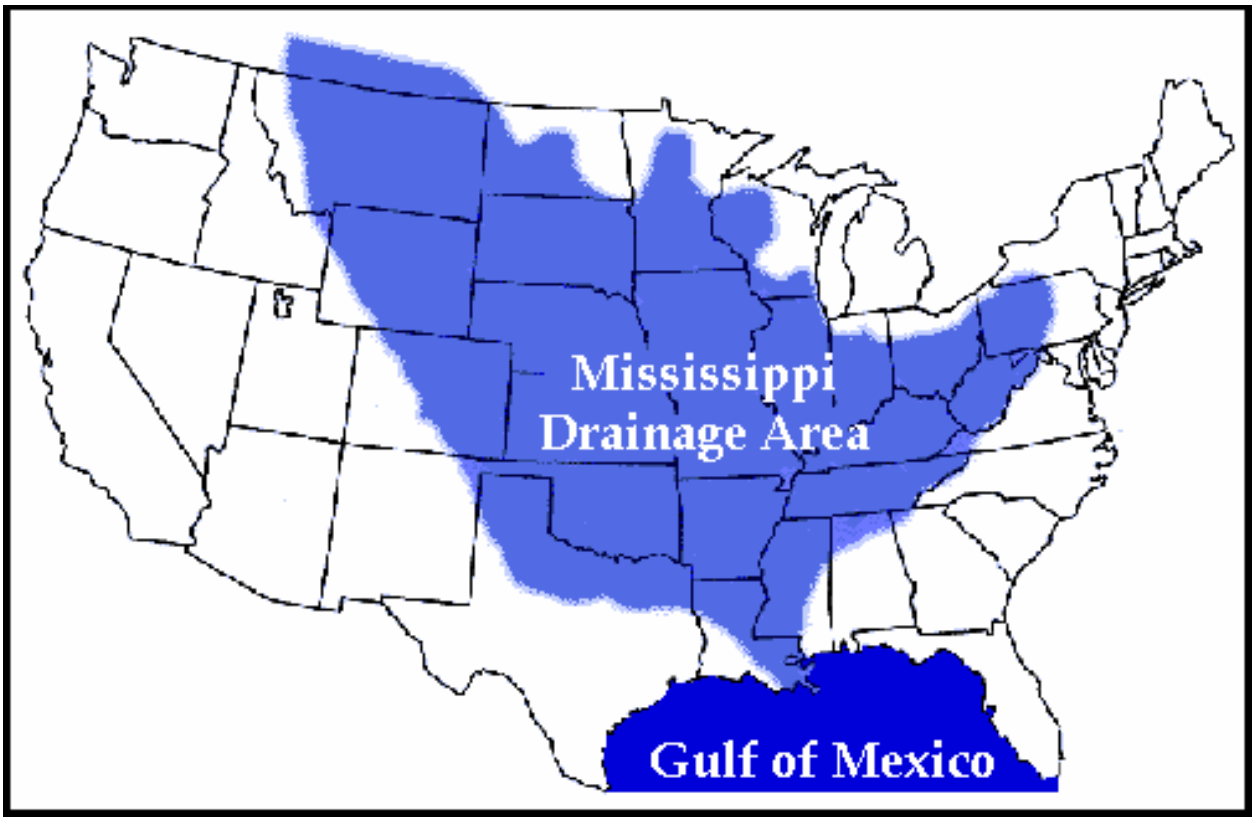


Image from http://www.lacoast.gov/education/FragileFringe/mississi.htm

Student Worksheet

Mapping the Barataria – Terrebonne Estuary System NAME _____

PART I. LOUISIANA ROAD MAP

1. The Barataria-Terrebonne Estuary System (BTES) lies between the Mississippi and the Atchafalaya Rivers. On your map find the spot where the Atchafalaya River separates from the Mississippi River and use a colored marker to highlight the path of each of these rivers.

2. List all the parishes that are found in the boundaries that you established in Question #1.

3. Locate **Simmesport** on State Highway 1 and find **Grand Isle** also on State Highway 1. Using the mileage values given on the map find the driving distance between the two sites.

4. Identify five Wildlife Areas found in the BTES.

5. Using a piece of string and the map legend (or another technique), determine the length of the Intracoastal Waterway from Harvey to Morgan City.

6. What is the geographic feature illustrated by:
   a. False River?

   b. Timbalier and East Timbalier Islands?

7. Using the grid system on the state map,
   a. Give the coordinates of Houma.

   b. Give the coordinates of Morganza.

PART 2 State Topographic Map

8. Give the approximate latitude and longitude of the point where the Atchafalaya River splits from the Mississippi River.

9. What is the contour interval used on this topographic map?

   How does use of this contour interval limit this map in providing an understanding of the physical characteristics of the BTES?

10. Identify the mapping symbol used at the **Clovelly Oil Field** (east of the city of Cut Off) and explain the use of this symbol.

11. If you were to drive Highway 1 from Simmesport to Grand Isle, what general changes in scenery and vegetation would you expect to view?

12. The remains of what barrier island are found off shore from Lake Pelto?

13. What is the most striking difference you notice between a road map and a topographic map? Explain which map gives you a better understanding for this part of Louisiana.

B. VIEWING STRATEGIES FOR *INTRODUCTION*

1. Introduce the following list of Key Terms

Barataria-Terrebonne	bayou	smuggling
hurricane	slaves	levee
cypress	maroons	crevasse
pirogue	reclamation	canals
steward		

2. Introduce the following list of peoples

Africans	Native Americans	Asians
Cajuns	Creoles	Germans
Isleños	Filipinos	Croatians

3. Instruct the students to listen carefully to the video as it identifies and explains the importance of the terms and contributions made by the diverse cultures.

C. POSTVIEWING QUESTIONS AND ACTIVITIES FOR *INTRODUCTIQN*

1. What is the meaning of the statement, "History and ecology are changing each other?"
2. How would you develop a paragraph with the following lead sentence:
   The people in the Barataria-Terrebonne Estuary system are linked to water.
3. How would you construct a paragraph with the following title:
   From spoon to steam shovels.
4. Why settle in wetland areas?

ACTIVITY: Investigating an Estuary

Background

The Barataria-Terrebonne system is an excellent location for identifying an estuary and considering its special characteristics. A body of water that provides a connection between a river system and the ocean where fresh water mixes with salt water is an estuary. Water will layer based on differences in temperature and salinity. This is because these differences determine density. When the fresh water of rivers meets the salty seawater, their mixing is slowed down by the layering caused by their respective densities. Time period: One 50 minute class period.

Objectives

1. To recognize layering caused by density differences.
2. To demonstrate the layering of ocean water and fresh water from rivers.
3. To illustrate mixing in water units of different densities.

Materials

For Engagement

2 empty tennis ball cans	two golf balls	water
sea salt or pickling salt	clear flat baking pan	food coloring

For Student Activity

small disposable cups	transparent (clear) straws	food coloring
salt	water	

For Closing Class Activity

ice water and ice	electric pot or hot plate	aquarium with slide divider

Advanced Preparation

Demonstration 1

1. Fill the two tennis ball cans with water. (Transparent tennis ball cans are necessary so students can observe the differences in behavior of the golf balls.)
2. Drop one golf ball into each can.
3. Add salt to one container, stirring the water to dissolve the salt until the golf ball in that can floats to the top.
4. Remove the golf balls from the cans and set aside for demonstration.

Demonstration 2

1. Prepare 1 liter of a salt water solution and add 8 drops of blue food coloring.
2. Rest one end of the pan on piece of dowel or pencil.
3. Fill 1/3 of the baking pan with the salt water (representing saline waters of the Gulf of Mexico).
4. Color one liter of tap water light green and carefully float this tap water (representing fresh waters of the Mississippi River) on top of the salt water layer.

Student Activity

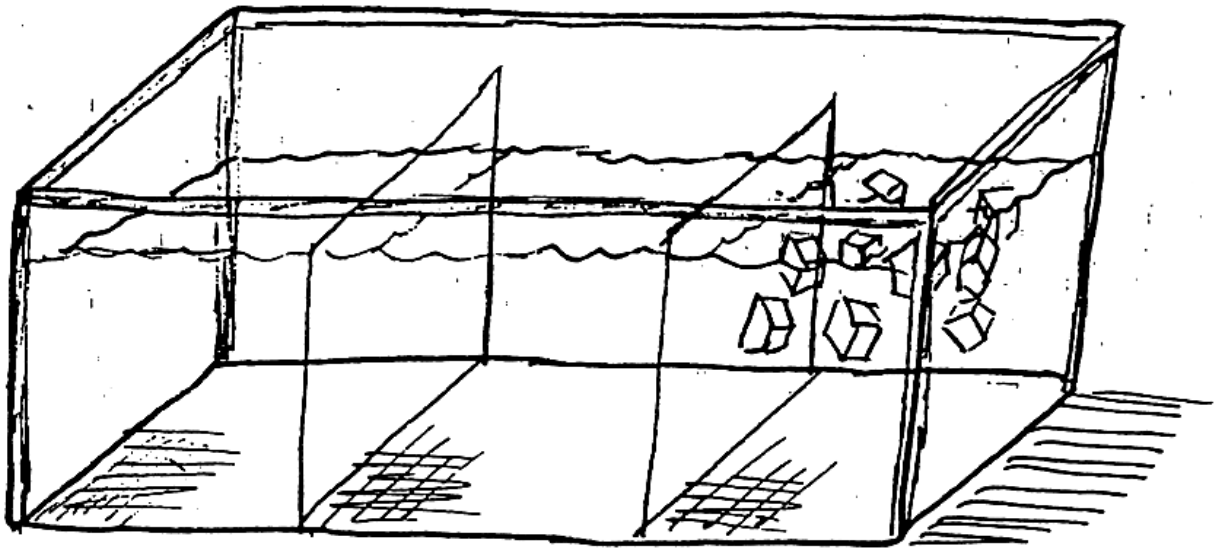
1. Solutions to be prepared ahead of time by the teacher:
    - one-liter of tap water with 10 drops of a food color
    - one-liter of tap water with 10 drops of a food color and one tablespoon of salt
    - one-liter of tap water with 10 drops of a food color and two tablespoons of salt
2. Student trays should be picked up by the materials manager and contain:
    - one empty cup, one cup of the first solution (fresh water),
    - one cup of the second solution (brackish water)
    - one cup with the third solution (ocean water)
    - one transparent (clear) straw.

Procedure

1. *Demonstration 1.* Begin discussion of density layering by showing the class the two tennis cans filled with water. Bounce both golf balls to show that they are the same and then place one in each of the containers of water. Question the class for explanations.
2. *Demonstration 2.* Use the clear baking pan to show the layering that results from the presence of two different types of water and initiate discussion of how this happens in nature. Besides the Barataria-Terrebonne System other major estuaries in the United States such as San Francisco should be identified and described. It may be appropriate to discuss the salinities found ocean side and land side of barrier islands. Demonstrate how the students will use the straw to collect a water sample from each of the cups. Keeping your thumb on the straw dip it into another color, open and close the covered end to collect a 1 cm sample of a second solution, and pull the straw keeping your thumb on the end of the straw.)
3. *Student Activity.* Students should be arranged in appropriate student groups. Distribute student worksheets, and have students follow the directions. Pre-prepared student trays with prepared materials should be picked up by one member of each group.

   During the time that the students are working with the solutions prepare a separated aquarium with ice, cold water and one food color on one side of the divider and warm water and food color on the other. When the students have completed their task, have them assemble around the aquarium. Have students observe the condensation pattern on the aquarium. As students share their observations and reasons for why this pattern might have occurred, ask what the students think will happen as the two different water masses in the tank are mixed. Have the students get eye level with the water line and slowly begin to pull the divider up. Completely remove the divider. Have the students put

their hands straight down into the water and then pull them directly out so they disturb the layers as little as possible. They may indicate the boundary between the water zones reminds them of experiences at the beach.



Vocabulary

density estuary salinity

Extensions

1. Construct a straw hydrometer to compare densities.
2. Construct a density column using various common household liquids.
3. Collect local water samples and test for properties like pH and salinity.

Student Worksheet

Density and the Layering of Water NAME_____

You should have on your tray one empty cup, one cup of the first solution (fresh water),one cup of the second solution (brackish water) and one cup with the third solution (ocean water), and one straw.

PART I

1. Using your straw collecting device, collect a 1 cm sample of one of the liquids in the cups on your tray. Record the color of sample. _____
2. Keeping your thumb on the straw dip it into another color, open and close the covered end to collect a 1 cm sample of a second solution, and pull the straw keeping your thumb on the end of the straw. Record the color of sample. _____ What else did you observe?
3. If the solutions in the straw got mixed up, empty the straw into the empty cup on your tray and reverse the order for collecting those two colors. What happened this time?
4. If the colors remained in separate layers, add the third solution (in the same way you did in Step 2) and describe the results.
5. If your colors are not layered, then empty your straw into the dump cup and continue trying until you have a nice ordered column arranged in your straw. Be sure to have your teacher observe your completed column of water within your straw. List the colors from top to bottom in your final arrangement.
6. What method of investigation did you use in this activity?
7. Do you think these layers would remain distinct over a long period of time? Explain why or why not?
8. If the density of water is 1 g/liter, what can you say about the density of seawater? Why?
9. What characteristic determines whether something will sink or float?

   Identify some solutions that you think would scale under water in a column.

   Outline how you would test your choices.

Part II

Briefly describe what happened when the divider was pulled from between the cold and warm water sections of the aquarium.

Explain what this experience tells you about a difference between cold and warm water based on the observations from Part I of this activity.

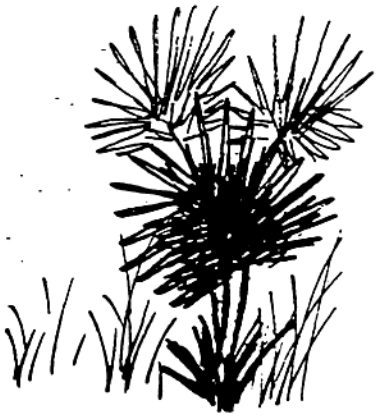
ACTIVITY: The Many Peoples

Objectives

1. To list immigrant groups who came to South Louisiana and incorporated skills from their homeland with the available natural resources to find new ways of life and occupations
2. To explain hardships endured by the inhabitants of the Barataria-Terrebonne region over the last two centuries
3. To identify the occupations perfected by particular immigrant groups within the region
4. To describe how people of South Louisiana have had to adapt their lifestyles to natural changes that have occurred within the Barataria-Terrebonne landscape and to human actions which have caused changes in the landscape

Procedure

1. Divide the class into 6 groups representing: the Cajuns French), Isleños (Spanish), Germans, Africans, Croatians and Asians. Instruct the students to research their immigrant groups over several class periods and find the following information:
   - when and why they came to South Louisiana
   - where they settled
   - how they created a way of life using skills from their homeland plus the available natural resources
   - other issues important the assigned culture
2. Have each group present to the class what they have learned. Suggest that they creatively make presentations using visual aids and/or props showing lifestyles and occupations. (Fishing nets, oyster shells, sugar cane, etc.)



Extension

Bring a guest speaker from a community group to speak on a population. Introduce songs, writings and stories from the different nationalities to the class. On a map, locate the homelands of the different people who came to South Louisiana.

Video Section:
FRONTLANDS AND BACKLANDS

A. PREVIEWING QUESTIONS AND ACTIVITIES FOR *FRONTLANDS AND BACKLANDS*

1. Why would cowboys be in the Barataria-Terrebonne estuary system?
2. What is your family ancestry?
3. Does your family ever need extra income?
4. Where is the country of Haiti located?
5. Where is the Senegal River located in Africa?

ACTIVITY: Soil Study

Background

While there was great excitement about "orange" soil on the moon during the late Apollo missions, there is no soil on the moon. Essential soil components, water, and humus – decaying organic material - are missing from the surface of our satellite. Dirt while seen under our feet is not something to be "looked down on". It is essential for the well being of all plants and animals in any habitat. A healthy soil includes broken rock materials, air, water and humus.

Many parts of the country enjoy the blessing of residual soil. These are soils that form from the bedrock in the region. The organic soils of the Barataria-Terrebonne system are transported soils brought here and deposited by running water. The annual cycle of flooding provides Louisiana with the best topsoil eroded from other places. These fertile fields are suitable for growing sugar cane and cotton crops. Time Period: Over a two day period

Objectives

1. To observe and describe variations in soils.
2. To investigate how soils form.
3. To explain interaction between the hydrosphere and lithosphere
4. To explore the erosional and depositional work of running water

Materials

- Soil samples - one provided by the student group and one distributed by teacher
- pH meter or probeware
- Clear vials with caps
- Microscope or hand lens

Procedure

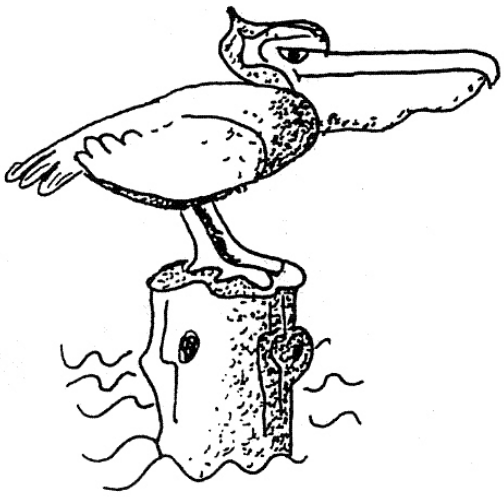
1. Open discussion of the appearance of the water in a nearby bayou or a river. Using a demonstration container of murky water, introduce the students to the transport of earth materials by running water.
2. While the students record their observations of the soil samples, the importance of the components - sand, silt, clay-should be identified as sizes of earth materials.
3. Testing for pH may be completed making best use of the materials available to the teacher. This may mean using a direct probe, completing a wash and using pH paper, or following the directions of a marketed product.
4. It is important that students clearly mark their group vial so that there is a minimum of disruption to the vials once the shaking is completed.
5. Distribute student worksheets

Vocabulary

clay	humus	pH
sand	silt	soil
turbidity	sedimentation	

Exploration

1. Set up a Winogradsky Column
2. Investigate the porosity, permeability and capillary action of your soil sample



Student Worksheet

Estuary Soils **Name** _____

Soil description

Using a small sample of the soil provided by your teacher and then your soil sample, describe the physical characteristics of each. Consider color, odor, moisture content, presence of organic matter, texture, and add your own observations.

Sample A _____

_____

Sample B _____

_____

Soil pH

Using the method demonstrated in class determine the pH of both samples.

Sample A _____
Sample B _____

Settling rate

From your soil sample place about 10 ml of dry soil into a clear vial labeled by your group and add water to fill three fourths (3/4) of the container. Cap and shake the contents for a couple of minutes. Place your sample in a spot where it will not be disturbed for the next 24 hours, Complete the chart below at the proper times.

OBS. #	TIME	WATER DESCRIPTION	SEDIMENT LAYERS (cm)
I.	**1 min**		
2.	**5 min.**		
3.	**1-3 hrs.**		
4.	**24 hrs.**		

B. VIEWING STRATEGIES FOR *FRONTLANDS AND BACKLANDS*

1. Distinguish between activities that occur on frontlands and those that occur on backlands.
2. List the various industries mentioned for both the frontlands and backlands.
3. Where is the natural high ground near bayous and rivers? How is this area formed?
4. What kind of living can you make living in a wetlands area?

C. POSTVIEWING QUESTIONS AND ACTIVITIES FOR *FRONTLANDS AND BACKLANDS*

1. List each season and describe the activities that take place during that time.
2. Have you ever harvested sugar? Do you know someone that has?
3. Do other plants make sugar?
4. If you managed a sugarcane farm, how would you control fertilizer and pesticide runoff?

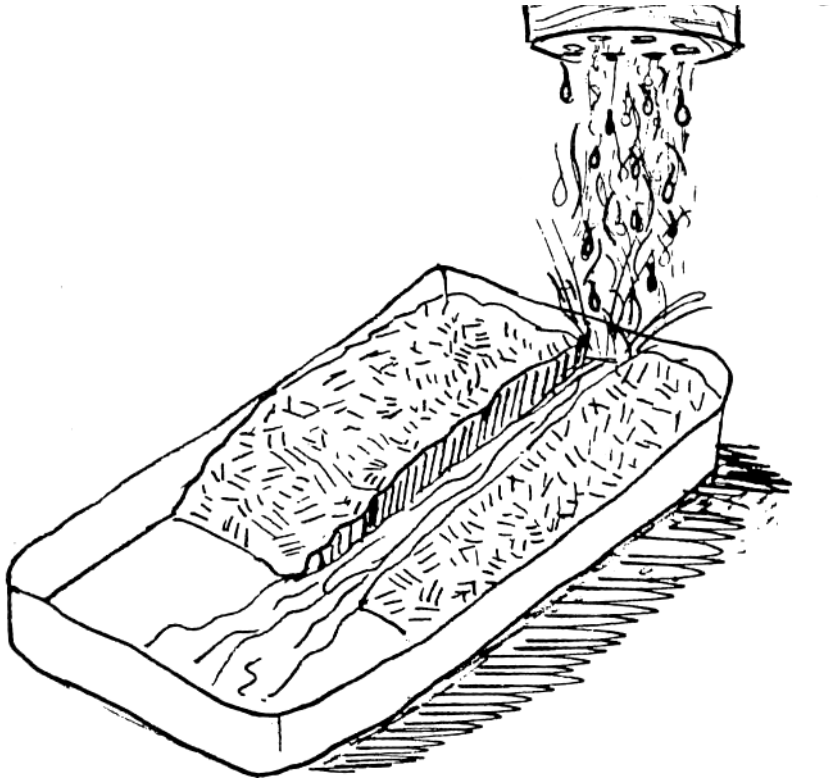
ACTIVITY: River Development

Background

When water falls to the ground, it begins to move from the continent to the ocean because of gravity. Flowing water has many different values for people: it is used for commerce (travel and trade), for animal and plant habitat and to irrigate farm fields, and to produce energy.

Running water is the dominant agent in erosion. Streams and rivers carry materials in three basic ways: solution, suspension and tumbling. Material being carried by the stream will be used as abrasive tools to further develop the stream bed.

Running water has always been an important resource to people. It provides energy, is necessary for travel, and trade and is the source of food from within and when used to irrigate farm fields.



Because of gravity, streams and rivers are always working their way to the ocean. The most active agent in the erosion process, streams and rivers, carry their sediment in three ways: solution, suspension and tumbling.

Over time the Mississippi has changed course repeatedly. Each time it establishes a new more direct, shorter path to the Gulf of Mexico. Currently the Old River Control Structure (built by the Corps of Engineers) prohibits the river from

changing its course. This structure guarantees the use of the ports of New Orleans and Baton Rouge.

Other hydrologic modification is achieved by levees, navigation canals, and channels dredged for mineral exploration. The levee system, built to protect our communities against flooding, prevents the natural sediment replacement. The canals and channels allow saltwater to move inland and expose the waterways to lateral erosion with each passing vessel.

Note: It would be helpful to the students to have a prepared stream table illustrating major river features. Some that should be marked: meanders, oxbow lakes, tributaries, sand bars, levees, delta. Remind students to keep the water source jug filled to prevent any change in pressure or flow.

Objectives

1. To model the formation of a stream development.
2. To delineate between the erosional and depositional work completed by a river system.
3. To understand the importance of surface water as part of the hydrologic cycle.

Materials

- stream tables or a large flat container such as a plant tray or aluminum roasting pan with a small drainage hole at one end with a pan to collect the runoff
- gallon jug for the water source and method to secure the jug above the stream table to allow a steady flow of water from holes in the bottom of the jug
- an assortment of sand, shell fragments and small aquarium gravel
- a block of wood to slightly elevate the stream table
- small flags or markers to identify features in stream morphology
- student worksheet

Procedure:

1. Each student group should have a stream table set up.
2. Have the students fill the upper two thirds of the stream table with a mixture of the earth materials-sand, shell fragments, and gravel. (Never use potting soil.)
3. Punch a small hole in the water jug and cover the hole with duct tape. Fill the jug and place it on a stand above the stream table.
4. Remove the tape and allow the water to establish a river system flowing down the stream table.
5. As river features develop, they should be marked by a flag or marker

Questions

1. Currently where is the only significant land building occurring in Louisiana?
2. What is the difference between a tributary and a distributary?
3. A thousand years ago where was the most significant land building occurring in Louisiana?

Vocabulary

hydrologic cycle	meander	dredge
spoil bank	channel	canal
sediment load	levee	erosion
deposition		

Student Worksheet

Stream Table Worksheet

NAME _____

Part I OBSERVING STREAM DEVELOPMENT

1. What do you observe when the water first flows into the stream table?

2. What materials did the water move first? _____

   What materials did the water move furthest? _____

3. In what part of the system did you observe erosion as the dominant force?

4. Where was there deposition? _____

As river features develop mark them using the flags or markers provided.

5. List the river features developed by this system that you marked.

6. What is the maximum width of the stream? _____ Where did this occur?

   What is the maximum depth of the stream? _____ Where did this occur?

7. What is happening to the length of this river system? Explain.

8. If this river led to a port city, what would have to be done to ensure passage of ships up the river to port?

9. What problems might result from this process?

10. Sketch and label the features found in your river system in the space to the right.

Your river system:

Part II VOLUME OF WATER

Double the flow of water into your stream bed.

11. What changes are seen in the river system?

12. As the volume of the stream increased what happened to the velocity?

13. What events would cause such an increase of water flow in a natural system?

Part III. HYDROLOGIC MODIFICATION

Set up a control structure using large rocks or some other material to stop the water.

14. What happened after you set up the blockage?

Use your fingers or a ruler to form a straight channel down the stream table.

15. Compare the flow of water in this arrangement to that of the natural stream pattern. What changes are observed?

Video Section:
TREMBLING PRAIRIES

A. PREVIEWING QUESTIONS AND ACTIVITIES FOR *TREMBLING PRAIRIES*

1. What do the following terms mean?

levee	spillway	marsh
wetland	swamp	barrier island
estuary	basin	delta

2. How is Spanish moss related to pineapples?
3. What is *detritus*?
4. Do you know any trappers?
5. How much would you pay to buy marsh land?

ACTIVITY: Grow a Floating Marsh

Objective

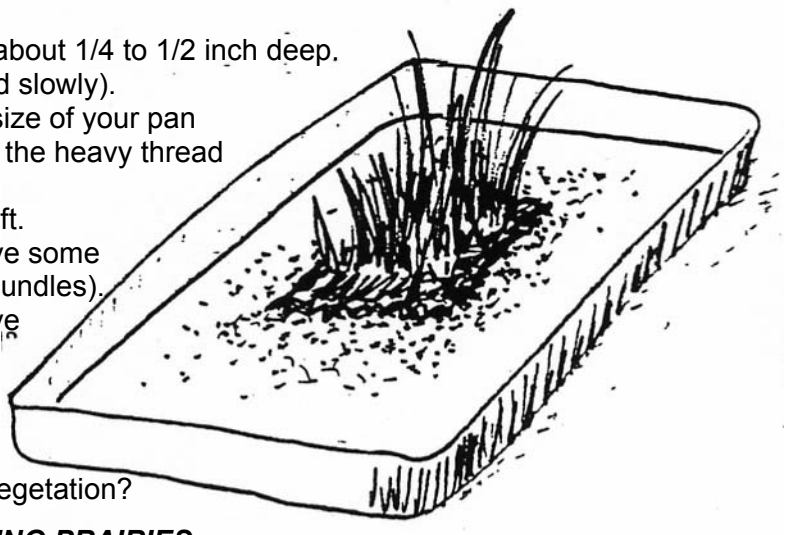
1. To create a floating marsh model similar to the Louisiana flotant marshes.

Materials

mud	hay	heavy thread
bird seed	alfalfa seed	rye grass seed
non-chlorine water (such as rain water or pond water	large flat pan (roasting pan or plastic storage bin)	

Procedure

1. Line the bottom of the pan with mud about 1/4 to 1/2 inch deep.
2. Pour water over the layer of mud (add slowly).
3. Make a square raft made of hay the size of your pan (weave straw together or bundle with the heavy thread and lash the bundles together).
4. Pour some water on top of the hay raft.
5. Place different seeds on the raft (leave some seeds on top and put some into the bundles).
6. Leave by a sunny window (if you leave it outside the birds may destroy your project). Every other day sprinkle some water on the hay raft. Record your results daily. What percentage area of the raft is covered by green vegetation?



B. VIEWING STRATEGIES FOR *TREMBLING PRAIRIES*

1. While watching the video, have students list the economic and/or ecological importance of each of the following

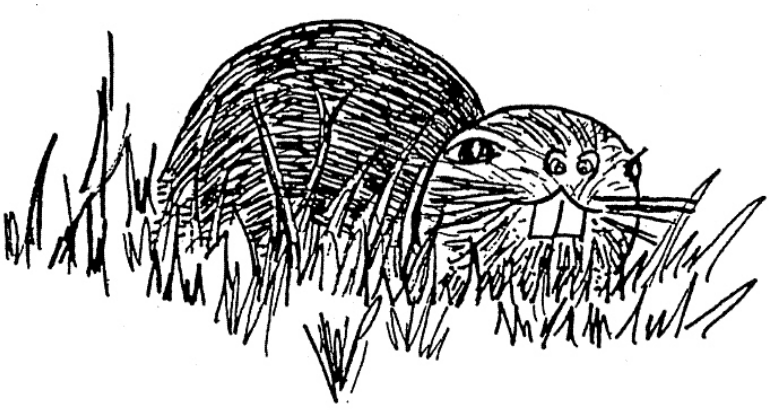
nutria	snakes	shrimp
crawfish	cypress trees	alligators
pelicans	owls	fish
crabs	oysters	ducks
sugar cane	Spanish moss	

C. POSTVIEWING QUESTIONS AND ACTIVITIES FOR *TREMBLING PRAIRIES*

1. What activities were carried out to prevent floods?
2. Why have we lost natural ridges?
3. If marshes were not suitable for agriculture, what good were they?
4. What were the consequences of the Civil War on the alligator population?
5. Write a paragraph describing the economic connections of marshes.
6. How did building the levees help agriculture?
7. How did the levees pose a problem to agriculture?
8. How did the oil industry affect the marshes?
9. What did the Indians use as a building material to construct the Indian mounds?
10. What qualities of cypress trees made the wood suitable for a building material?
11. How did the increase in alligator hunting affect the muskrat population? How did the muskrat population eventually affect the marshes?
12. What are conservation groups doing to increase the alligator population?
13. Why did people believe that it was not a good idea to eat oysters in hot months?
14. To which country were dried shrimp and fish exported during the early 1900's? What historic event changed this market?
15. In what way(s) were the fertilizers and pesticides used on sugar cane crops damaging to the Barataria-Terrebonne basin?

Extensions

1. Take students on a swamp tour or visit an alligator farm.
2. Prepare a classroom display of Louisiana products brought in by students.
3. Provide samples of sugar cane and have students design a process to remove the sugar from the sugar cane.
4. Examine a sample of Spanish moss with a dissecting microscope or hand lens. What kind of life is found on the moss?
5. Using old copies of "Louisiana" magazines (e.g. ***LA Conservationist***), create a collage depicting the problems or habitats discussed in the video.
6. Have students begin a folder or prepare a bulletin board of newspaper articles which discuss topics in the video.
7. The video mentions the introduction of the nutria from South America. Have students look up other animals or plants introduced to Louisiana that were not "natural" to the area. Have any created problems?
8. Recently, Jefferson Parish experienced a problem with the nutria population. What led to the population increase? What problems did this create for the parish? How did the parish eventually deal with the problem?



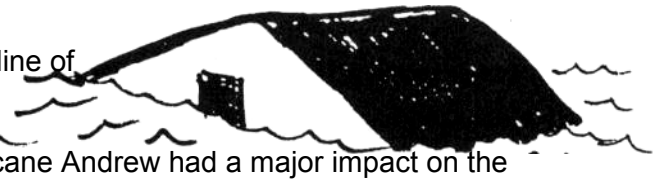
Video Section:
LIFE FROM THE WATER - DEATH FROM THE SEA

A. PREVIEWING QUESTIONS AND ACTIVITIES FOR *LIFE FROM THE WATER – DEATH FROM THE SEA*

1. What do you remember about Hurricane Andrew?
2. Do you know of any other destructive storms that have occurred in the southern part of Louisiana?
3. Do you know anybody that makes their living as a commercial fishermen? Describe his or her life?
4. Before ice and refrigeration, how was seafood preserved?
5. Is tourism an important business in the Barataria-Terrebonne estuary system? Why?

ACTIVITY:

Background



There are many forces working to shape the coastline of Louisiana. One of nature's major tools for shaping the islands, altering the marshes and forests, and depositing sediments is a hurricane. In 1992 Hurricane Andrew had a major impact on the coastal fisheries and forested wetlands.

Objectives

1. To explore hurricanes and recognize their strength to change and alter systems
2. To investigate interaction between the Earth' s subsystems
3. To develop an awareness and appreciation for developments in technology

Materials

- student copies of a map for plotting the hurricane path
- data table with positions of hurricane Andrew
- blackline master showing the Gulf Coast area with tracks of past hurricanes

Procedure

1. Post the names selected for this year's hurricanes. Ask the students to name any hurricanes that they have heard about from their families.
2. Have the students research the formation of hurricanes. Assign specific hurricanes that have dealt a significant blow to the BTES to student research teams. Team reports should include the path of the storm, location where the eye came ashore, Saffir-Simpson category, highest wind speed, lowest air pressure, and other details.
3. Transparencies of the storm paths can be stacked by year to demonstrate the constant danger these natural forces hold for coastal residents.
4. Distribute the Location Data Table for Hurricane Andrew and a hurricane tracking map to plot its path (see next two pages). Have students complete individual maps using the latitude and longitude values.

Questions:

1. What are the stages of hurricane development?
2. Between which two readings is there the greatest apparent change in position for the storm?

3. Using the Saffir-Simpson scale, what was the highest category reached by Andrew?
4. What physical conditions of the region aid the development of hurricanes?
5. What tools are available today to predict when and where a hurricane will make landfall? What precautions should people take to minimize damage to property and help prevent loss of life?

Extensions:

1. Discuss with older family members any hurricane they remember and write a report on how it affected their family and property.
2. Research 1985 and the hurricanes that impacted the BTES.
3. Prepare a list of items that should be in a household emergency kit for hurricane preparation and make sure your home has one.
4. Find a written historical account of a hurricane impact and recite it for the class.
5. Compare a series of maps or photos that document coastline changes over several decades following hurricane strikes.
6. Hurricanes are not the only disasters that force people to leave their homes. On a map identify an evacuation route that your family would use if forced to leave.

Vocabulary

cyclone eye storm surge

Hurricane Andrew Making Landfall in Louisiana (August 25, 1992).

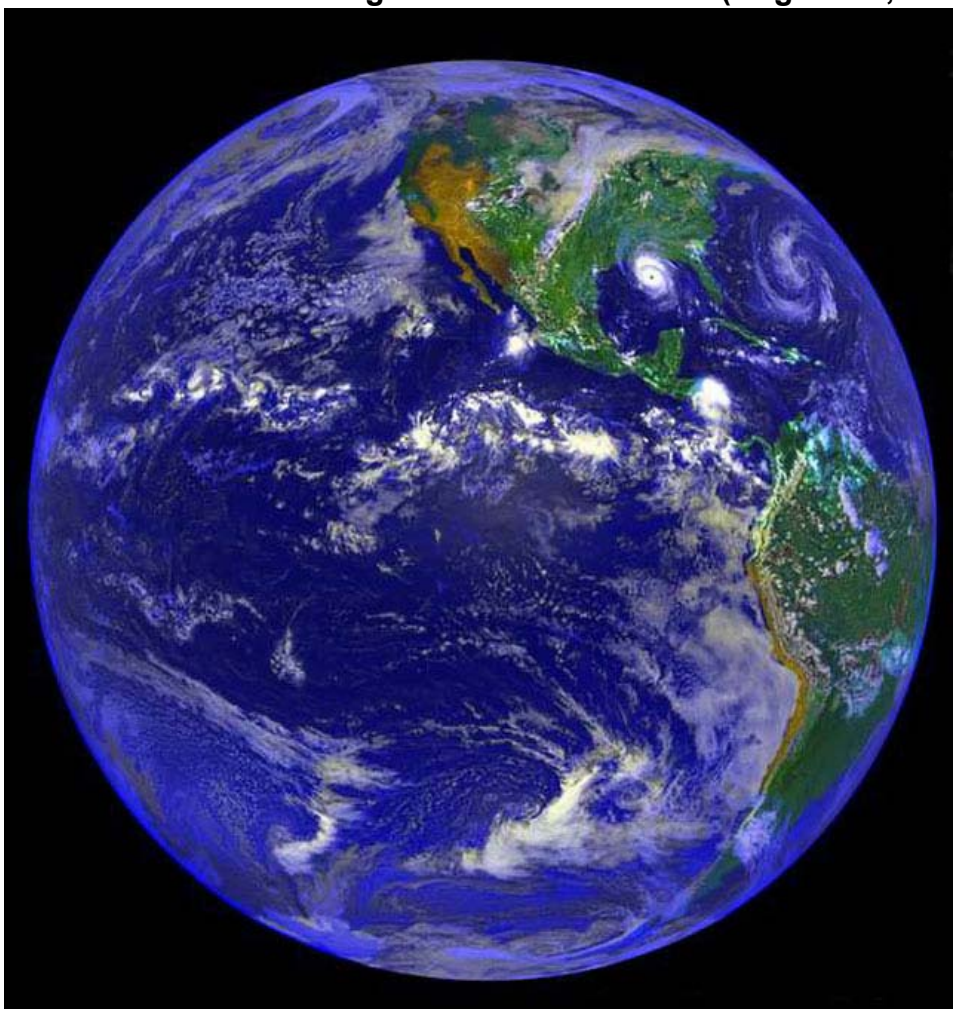


Image credit: NASA Marshall Space Flight Center, Hurricane Andrew Making Landfall in Louisiana (August 25, 1992), accessed July 23, 2004, at http://www1.msfc.nasa.gov/newsroom/camex/photos/ev1782_PIA01462_md_m.jpg

Location Data Table for Hurricane Andrew

DATE	Time	Latitude N	Longitude W
August 22	1 am	25.6	67.0
	7am	25.8	68.3
	1 pm	25.7	69.7
	7pm	25.6	71.1
August 23	1 am	25.5	72.5
	7 am	25.4	74.2
	I pm	25.4	75.8
	7 pm	25.4	77.5
August 24	1 am	25.4	79,3
	7 am	25.6	81.2
	1 pm	25.8	83.1
	7 pm	26,2	85,0

Date	Time	Latitude N	Longitude W
August 25	1 am	26.6	86.7
	7 am	27.2	88.2
	1 pm	27.8	89.6
	7 pm	28.5	90.5
August 26	1 am	29.2	91.3
	7am	30.1	91.7
	1 pm	30.9	91.6
	7pm	31.5	91.1
August 27	1 am	32.1	90.5
	7 am	32.8	89.6
	1 pm	33.6	88.4
	7 pm	34.4	86.7

Data Reference: ***Willful Winds***, Louisiana Sea Grant 1996

Hurricane Andrew Approaching the Louisiana Coast, August 25, 1992.

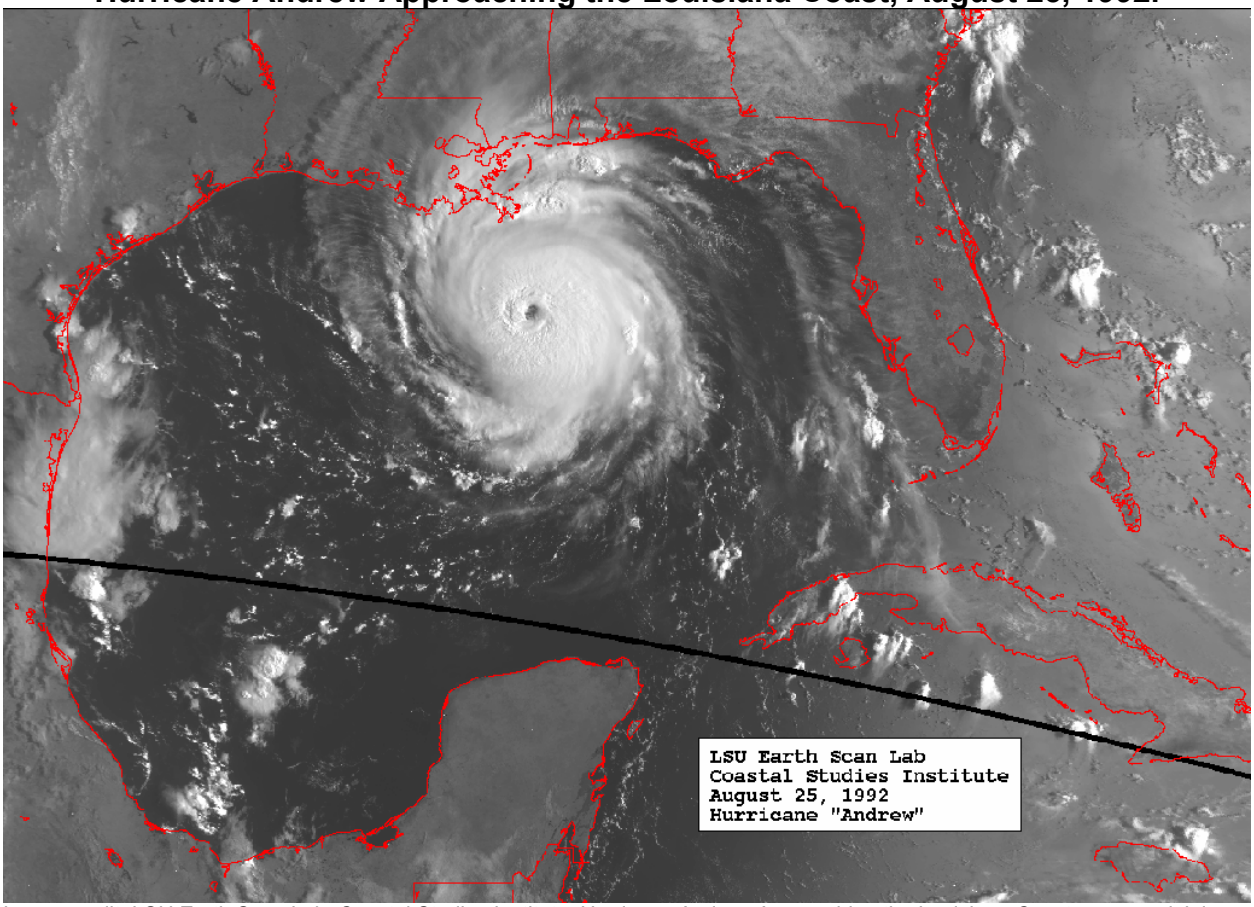
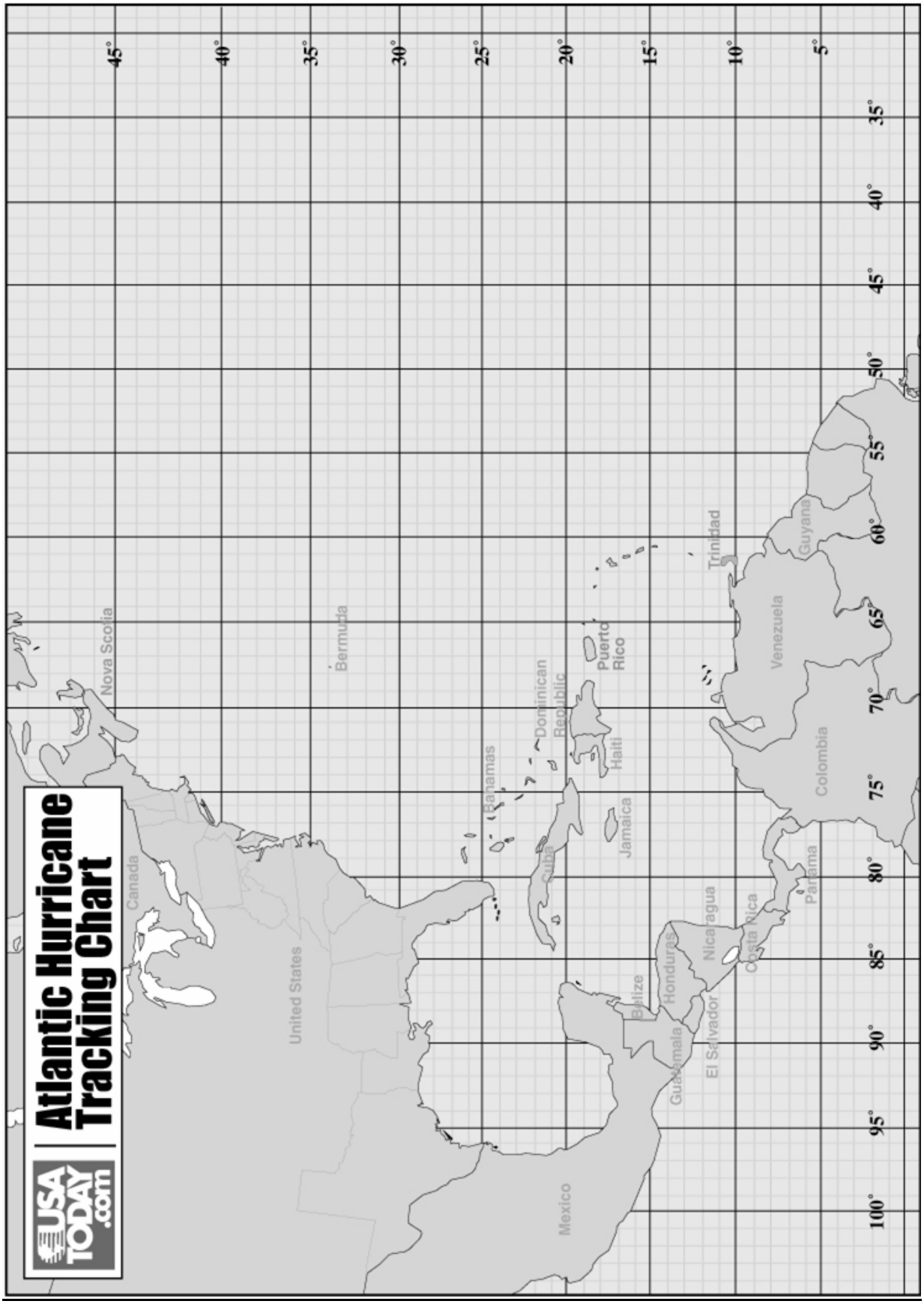


Image credit: LSU Earth Scan Lab, Coastal Studies Institute, Hurricane Andrew Approaching the Louisiana Coast, accessed July 23, 2004, at http://www.loep.state.la.us/hurricanerelated/hurandre.htm



USAToday.com, Atlantic Hurricane Tracking Chart, accessed July 23, 2004 at http://www.usatoday.com/weather/wtrack.htm

B. VIEWING STRATEGIES FOR *LIFE FROM THE WATER-DEATH FROM SEA*

1. Follow the development of the shrimping industry.
2. What cultures made contributions to the shrimping industry and what were those contributions?
3. What were significant technological changes that occurred that changed the seafood industry?
4. Pay attention to the story of Caminadaville.

C. POSTVIEWING QUESTIONS AND ACTIVITIES FOR *LIFE FROM THE WATER-DEATH FROM SEA*

1. What was the dancing of the shrimp?
2. Where was the primary market for dried shrimp?
3. In paragraph form describe how the resources of the Barataria-Terrebonne estuary system made a connection to the American dream?
4. The video stated that Filipinos knew about typhoons. Why didn't the Croatians have such knowledge?
5. Read ***The Awakening*** by Kate Chopin.
6. What is the function of barrier islands?

ACTIVITY: Come On Down

This is designed to be an activity for the end of a unit on the Barataria-Terrebonne estuary system.

Background

The richness of the Barataria-Terrebonne estuary system (BTES) - its people, recreational activities and economic resources – is being used to bring visitors to the region. This industry is called **ecotourism**. People who spend time viewing the plants and animals in their habitat being exposed to the culture and cuisine, and enjoying the fishing and boating opportunities will better understand the importance of this and other estuaries. Time period: One class period for assigning the project and allowing the student groups to develop a presentation plan. An appropriate independent work time line should be given to the students.

Objectives

1. To identify the distribution and utilization of natural resources.
2. To explain how the characteristics of different physical environments affect human activities. (and vice versa)
3. To locate and describe the BTES geographic features and examine their potential for recreational tourism.

Materials

- construction paper, drawing materials, glue
- examples of brochures, trifolds and posters from travel agencies, vacation resorts
- assorted local pictures and/or old magazines that may be cut up

Procedure

1. Display travel posters and brochures around the room for student inspection.
2. Ask students what places they would most like to visit. Students should tell why they selected certain vacation sites and indicate if they have already had the chance to visit the places mentioned. Have some students been to places that others have on their wish list? What makes the "best" kind of vacation?

3. In their small cooperative groups have students list what people would look for in a vacation place for their families. Establish a class list of travel criteria from the group lists. Have the students identify how the BTES meets different points on their class list.
4. Have the small groups complete a flow chart or concept map to illustrate how a community benefits from the money spent by tourists. This organizer may be completed on a sheet of flipchart paper or an overhead transparency for presentation to the whole class.
5. Prepare each group to become an advertising agency discussing the work and importance of these businesses. Instruct the class that each agency is to prepare a complete sales package to promote a vacation to the BTES. Their group presentation must include a full poster for display, a trifold (with general information on climate, life forms, activities, particular places and events, etc., using the school address for their agency location and a creative name their company.) and an oral presentation.
6. Have the student groups present their sales package in class. If possible make arrangements for video taping the presentations to provide student copies.

Teacher note: It is essential that the students understand the importance of preserving a healthy environment and of managing the resources that are found here to insure the growth of a tourist industry. Do they have any information that indicates a future problem in sustaining any of the systems, resources?

ACTIVITY: Oysters

Background

Mollusks, you will remember, are soft-bodied invertebrates. Invertebrates are animals that do not have a backbone. To protect their soft body, most mollusks have shells made of a material called calcium carbonate. This material is made and released by the outermost membrane of their soft bodies called the ***mantle***. Believe it or not, there are over 80,000 species of mollusks world-wide that live in such diverse environments as land, salt water, and fresh water. Some of these mollusks have one shell, some two shells, some have several overlapping plates, and some lack shells altogether. The mollusk we are going to investigate today is one with two shells, which is called a ***bivalve***. This mollusk is the **oyster**.

The oyster has long been harvested by humans as a source of food. Like other mollusks, it breathes using a ***gill*** which is located in a space called the ***gill cavity***, formed by the thin membrane that covers the oyster, called the ***mantle***. Water enters the space enclosed by shell and mantle through a tube called the ***incurrent siphon***. Once inside the cavity, the water encounters the oyster's cilia. ***Cilia*** are tiny hair-like threads of cytoplasm embedded in the cells of the gills where they serve two purposes. First, these cilia maintain a flow of water over the gills, allowing the oyster to breathe. Second the cilia pass along tiny particles of food in that water to the mouth, because cilia on the gills of the oyster remove this food, we say that oysters *are* ***filter feeders***. This method of feeding means that oysters are able to eat almost any small organic matter, including bacteria. All of this food is good for the oyster, which does not get sick from what it filters out of the water. Oysters that filter out harmful microbes, however, can pass these bacteria on to anyone who eats these tasty mollusks.

Oysters are so good at removing particles from the water that they can filter out the algae that cause ***red tides*** and never get sick themselves from the toxins those microbes make. Again, however, their gain is our loss because if we eat contaminated oysters, we become sick. It is the oyster's ability to remove particles from the water that makes them so successful and yet so dangerous to us at the same time.

After the food particles are filtered from the water, the cilia move them to the mouth. From the mouth the food passes through the oyster's digestive system, located in the ***visceral hump****, the* main body of the oyster. That visceral hump contains the stomach, liver, heart, gonads, kidney, and intestine. At the end of the digestive system lies the *anus,* through which wastes pass out of the visceral mass and back into the water of the gill cavity. Another tube called, the ***excurrent siphon****,* pumps water from which food and oxygen have been removed from inside the oyster's shell.

Opening up an oyster is no easy task. Although it has a soft body, the oyster also has a very strong ***muscle*** to hold its shell closed. To expose the oyster, the muscle must be cut. Cutting that muscle is the job of the oyster knife, but the action is tricky because the edges of the oyster's shells are sharp and can easily cut into the hands that hold the oyster.

Oysters grow best in ***brackish*** waters; that is, waters that are a mixture of salt and fresh. These waters are usually full of the organic matter that oysters filter out and eat. Oysters are tasty morsels to more that just humans. Marine snails called ***oyster drills*** make holes in oyster shells and eat the oysters inside. Starfish eat oysters too, pulling their shells apart with the pressure exerted by their arms. Raccoons also love to eat these mollusks.

Oysters live best where they can settle on a bottom hard enough to keep them from sinking into the mud and being smothered with silt. They also prefer warmer waters although they can grow in colder temperatures. Oysters usually spawn in late spring in our warm waters, stimulated by an increase in water temperature between June and September. Larval oysters settle on a firm substrate called a ***clutch****,* such as oyster shells or clam shells. They then secrete a kind of glue to hold them to the clutch. Never again do they move on their own.

Since oysters tend to settle on the shells of other oysters, they can form great reefs along the Gulf Coast. These reefs, in turn, become home to a wide variety of other organisms, including tiny crabs, worms, clams, shrimp, snails, barnacles, and fish. Each clump of oysters can be a small community in which several species interact with each other.

Objectives

1. To list those characteristics of oysters that identify them as mollusks
2. To describe the habitat of oysters
3. To correlate the feeding method of oysters with the hazards involved in eating

Materials *(Per group)*

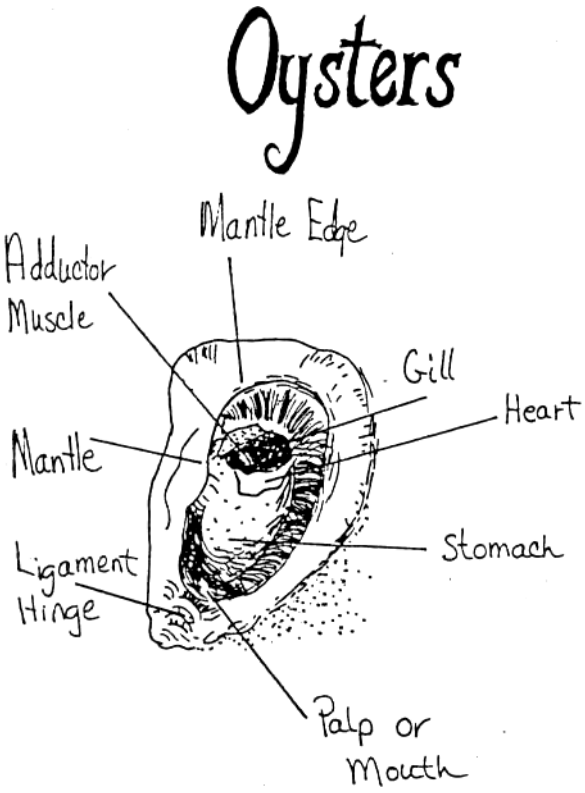
clump of oysters (unwashed)	dropper bottle of water	small mesh screen or sieve
hand lens	2 bowls or buckets	forceps
probe	oyster glove	oyster knife

Procedure

1. Examine your oyster clump carefully. Remove some of the mud that clings to the shells and rub it in between your fingers. Describe how it feels (smooth, silty, sandy)?
2. Place your oyster clump in the sieve or screen over the bowl or bucket. Carefully wash the clump by squirting water over the clump from your dropping bottle. Refill your bottle as often as necessary to get all of the mud off your clump. Watch for any organisms that may be exposed. Carefully remove them and place them in another dish for later examination. Be sure to keep the oysters and any organisms you remove moist,

preferably with some of the original water in which the oyster was located.

3. When you have removed all of the sediment possible, carefully pull the oysters in the clump apart. Wear your oyster gloves and be careful not to slice up your hand. Watch for any more organisms that might be exposed and place them with the others. When you have pulled apart all of the oysters in your clump, set them aside and examine the organisms that were exposed during the cleaning and separation of your clump. Describe and/or sketch them. Try to identify the group to which each belongs.
4. Now you are going to open your oyster. Each person who opens oysters has his/her own way of slicing into these mollusks, but there is no really easy way and any way is potentially dangerous, so be very careful. Place the oyster glove on the hand you do not use to write. Hold the oyster knife in the other hand. Hold the oyster in the gloved hand so that the thickest part of the oyster is closest to your wrist. Look at the side of the shells and find where the two edges come together. Carefully insert the tip of the oyster knife in between the two shells. Gently push the knife around, keeping the tip pointed upward inside the shell. This management of the oyster knife is to protect you and to prevent tearing up the oyster as well. Use gentle force to pry open the two shells. Use the knife to cut through the muscle that holds the two shells together. Once that muscle is severed, the oyster should open easily. There are several oysters in your clump, so don't be upset if your first is spoiled. Try again and again, as long as is necessary or you have oysters available.



5. Lay the oyster out so that the body is inside one of the shells. Examine the body with the hand lens. Feel the thin covering of the body with your fingers. Gently press the body with your fingers to feel how soft it is. Use your probe and forceps to gently hold up the edge of the mantle so you can see the gills. Notice that one part of the oyster is thicker than the rest. That is the ***visceral hump***. Notice that there is a dark area on the other shell. That is the place where the muscle was attached, and it is called the ***muscle scar***. Sketch your oyster in its opened shell and label the parts that you can identify. Note those parts that characterize this organism as a mollusk.
7. Now clean up your station, placing the used materials and tools where your teacher indicates.

Analysis and Conclusions:

1. Describe the habitat for other organisms provided by your oyster clump and guess what needs that the oyster clump was able to supply to the other inhabitant(s).
2. What is it about our coastline that makes it such an ideal place for oysters and their "'fellow travelers" to live?
3. Explain why oysters are called 'filter feeders'. What is it about that method of getting food that makes them potentially dangerous for other organisms to eat?

Extensions:

1. Dissect the oyster. Sketch and label its internal anatomy.
2. Research methods used to harvest and prepare oysters for sale.
3. Collect recipes for cooking oysters and hold an oyster fest.
4. Visit an oyster cannery.
5. Invite an oysterman to come speak on harvesting oysters.
6. Visit local seafood museum (e.g., Biloxi Seafood Museum).
7. Learn about cultural uses of oysters and oyster shells.

Bibliography

Irby, Bobby, Malcolm K. McEwen, Sheila A. Brown, and Elizabeth M. Meek. *Diversity of Marine Animals,* Jackson, MS: University Press of Mississippi for Mississippi-Alabama Sea Grant Consortium, 1984, pp. 40 - 43.

Skelton, Zan. *Oystering on the Mississippi Gulf Coast.* Book IV: Marine Discovery Series. Biloxi, MS: Shanghnussy Printing CO., Bureau of Marine Resources, 1972.

References

BTNEP Publications:

Barataria-Terrebonne National Estuary Program, (1995). Saving our good Earth: A call to action Barataria-Terrebonne Estuarine System characterization report. Thibodaux, LA: Barataria-Terrebonne National Estuary Program.

Condrey, R. *et al.* (1995). Status. trends, and probable causes of changes in living resources in the Barataria and Terrebonne estuarine systems. BTNEP# 21.Thibodaux, LA: Barataria-Terrebonne National Estuary Program.

McKenize, L. S. III, et al. (1995). Land use and socioeconomic status and trends in the Barataria-Terrebonne Estuarine system. BTNEP #23. Thibodaux, LA: Barataria-Terrebonne National Estuary Program.

Moore, D. M. & Rivers R. D. (1996). The executive summary: Program objectives, action plans and implementation strategy at a glance. CCMP - Part 1. Thibodaux, LA: Barataria-Terrebonne National Estuary Program.

Moore, D. M. & Rivers R. D. (1996). The estuary compact: A public-private promise to work together to save the Barataria and Terrebonne Basins. CCMP - Part 2. Thibodaux, LA: Barataria-Terrebonne National Estuary Program.

Moore, D. M. & Rivers R. D. (Eds.) (1996). The technical supplement: CCMP action plan details for plan implementation. CCMP - Part 3. Thibodaux, LA: Barataria-Terrebonne National Estuary Program.

Moore, D. M. & Rivers R. D. (Eds.) (1996). The appendix: CCMP supplemental content requirements and program support documentation. CCMP - Part 4. Thibodaux, LA: Barataria-Terrebonne National Estuary Program.

Rabalais, N. N. *et al.* (1995). Status and trends of eutrophication, pathogen contamination, and toxic substances in the Barataria-Terrebonne Estuary System. BTNEP #22. Thibodaux, LA: Barataria-Terrebonne National Estuary Program.

Reed, D. (Ed.) (1995). Status and trends of hydrologic modification, reduction in sediment availability, and habitat/loss modification. BTNEP#20. Thibodaux, LA: Barataria-Terrebonne National Estuary Program.

Other good references:

Amos, W. H., & Amos, S. H. (1985). The Audubon Society Nature Guides. New York: Alfred A. Knopf.

Banbury, M. M., *et al.* (1991). Welcome to the wetlands: An activity guide for teachers. New Orleans, Louisiana Nature and Science Center.

Banbury, M. M., *et al.* (1997). Lessons on the lake: An educators glide to the Pontchartrain Basin. Metairie, LA: The Lake Pontchartrain Basin Foundation.

Britton, J. C., & Morton, B. (1989). Shore ecology of the Gulf of Mexico. Austin, TX: University of Texas Press.

Chase, V. Living in water. National Aquarium in Baltimore, Pier 3, 501 East Pratt Street, Baltimore, MD 21202. For grades 4-6. 800/ 228-0810; Website: http://www.aqua.org/education/teachers/water.html

Deans, N. (Ed.). (1993). The Gulf of Mexico [Special Issue]. Currents: Journal of Marine Education. Monterey, CA: National Marine Educators Association.

Douglass, M. S. (1947) The Everglades: River of Grass. Pineapple Press (FL).

Fontenot, M. A. Clovis crawfish and his friends (and others in the series). Also available on audiocassettes (two tales with songs per tape), Pelican Publishing, 1-800-843-1724.

Gore, R. H. (1992). The Gulf of Mexico: A treasury of resources in the American Mediterranean.

Sarasota, FL: Pineapple Press.
Gulf of Mexico Program. (1991). Marine debris action plan for the Gulf of Mexico. Stennis Space Center, MS: Author.
Gulf of Mexico Program. (1992). Marine debris action agenda: Addendum (5.1). Stennis Space Center, MS: Author.
Gulf of Mexico Program. (1993a). Living aquatic resources action agenda (2.1) for the Gulf of Mexico. Stennis Space Center, MS: Author.
Gulf of Mexico Program. (1993b). Nutrient enrichment action agenda (3.2) for the Gulf of Mexico. Stennis Space Center, MS: Author.
Gulf of Mexico Program. (1993g). Public health action agenda for the Gulf of Mexico. Stennis Space Center, MS: Author.
Gulf of Mexico Program. (1993d). Coastal & shoreline erosion action agenda for the Gulf of Mexico. Stennis Space Center, MS: Author.
Gulf of Mexico Program. (1993e). Toxic substances & pesticides action agenda for the Gulf of Mexico. Stennis Space Center, MS: Author.
Gulf of Mexico Program. (1993f). Habitat degradation action agenda (4.I) for the Gulf of Mexico. Stennis Space Center, MS: Author.
Gulf of Mexico Program. (1993g). Freshwater inflow action agenda for the Gulf of Mexico. Stennis Space Center, MS: Author.
Hickman, P. (1993). Wetlands. Toronto, Ontario: Kids Can Press Ltd.
Hogan, K. (1994). ~. Dubuque, Iowa: Kendall/Hunt Publishing Company.
Hunken, J. (1994). Ecology for all ages: Discovering nature through activities for children and adults. Old Saybrook, Connecticut: The Golbe Piquot Press.
Jones, G. Project Estuary (gr. 6-12) and Sound Ideas: Elementary Project Estuary, An Estuarine Ecology Curriculum Guide (gr. K-6). North Carolina National Estuarine Research Reserve, NC Division of Coastal Management, 135 Duke Marine Lab Rd., Beaufort, North Carolina 28516; Education office (252-728-2170)
Kennedy, J. (1991). A View from the Heart. Bayou Country Ecology. Blue Heron Press.
Lockwood, C.C. (1984). The Gulf coast: Where land meets the sea. Baton Rouge, LA: Louisiana State University Press.
Maraniss, L. (1991). The Gulf of Mexico a special place: Creative activities for the classroom. Washington, DC: Center for Marine Conservation.
Matthews, D. (I994). Wetlands. New York: Simon & Schuster.
Michener, J. (1978). Chesapeake. Random House.
Mitsch, W.J. & Gosselink, J. G. (1986). Wetland. New York: Van Nostrand Reinhold Company.
Nature scope, National Wildlife Federation, 1400 Sixteenth Street NW, Washington, D.C. 20036-2266.
Teal, J. & Teal, M. (1969). Life and death of a salt marsh. Little Brown and Company.
Trowbridge, J. E. (1994). Gulf literacy: A teacher's guide. Baton Rouge, LA: Dept. of Curriculum and Instruction.
Project WET (1995). The Project Wet Curriculum & Activity Guide,. Bozeman, MT: Project WET and the Western Regional Environmental Education Council.
Weber, M., Townsend, R. T., & Bierce, R. (1990). Environmental equality in the Gulf 0f Mexico: A citizen's guide. Washington, DC: Center for Marine Conservation.