Educator's Guide to the Barataria-Terrebonne Estuary

Edited and Compiled by
Dr. Pamela Borne Blanchard
2006

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Acknowledgements

"An Educator's Guide to the Barataria-Terrebonne National Estuary" is brought to you through the efforts of many educators, advisors, coordinators and student interns. Dr. Pamela Borne Blanchard of Louisiana State University's Department of Curriculum and Instruction has done an outstanding job of bringing wonderful wetland activities to students of all ages. These lessons use a variety of different teaching and learning strategies. Dr. Blanchard has standardized the format of the lessons and given them a modern twist that will delight teachers and pupils alike. The matrix at the beginning of this document is designed by Dr. Blanchard to allow educators quick access to the scientific topic of interest, appropriate grade levels, and the Louisiana Grade Level Expectations addressed by each activity. Dr. Blanchard has done an exceptional job of bringing this book through a long history of development; she is without a doubt one of the National Estuary Programs' finest wetland educators.

Deborah Friday Schultz, former Formal Education Coordinator of the Barataria-Terrebonne National Estuary Program (BTNEP), had the vision of creating an educator's guide to this wonderful wetland ecosystem and was instrumental in its development. Schultz worked closely with a design team that included the BTNEP Education Action Plan Team, Dr. Pam Blanchard, Valerie Butler of Hahnville High School in St. Charles Parish and Butler's writing team. Lessons represented in this guide are drawn from a variety of BTNEP educational resources, including ideas and lessons put forward by Butler's writing team, lessons from the unpublished BTNEP/Louisiana AgCenter's *Coastal Land Loss and Restoration Curriculum*, *Wetlands Function and Values Curriculum*, and *Nonpoint Source Water Pollution Curriculum*, lessons adapted from other environmental education curricula, as well as original lessons by estuary educators.

Special thanks and appreciation goes to Sandra Helmuth, Administrative Coordinator of the BTNEP, for her untiring efforts in helping to prepare graphics, edit, review, and finalize documents and lessons. We would also like to recognize the BTNEP student interns, Lainey Pitre and Shelley Sparks, for their efforts.

The BTNEP Education Action Plan Team would especially like to express their gratitude to Kerry St. Pé, BTNEP Program Director, for his faithful leadership on wetland issues and his desire to keep environmental education in the forefront of Louisiana citizens.

The BTNEP staff invites you to continue the adventure of teaching and learning with this book.

Kind regards,
Susan Testroet-Bergeron and the BTNEP Education Action Plan Team
Spring 2006

Dedications

- With thanks and appreciation to those among us that work to preserve, restore and protect the natural beauty of our Louisiana coast.

Pamela Borne Blanchard

- With great thanks and appreciation to Deborah Friday Schultz, former Formal Education Coordinator of the Barataria-Terrebonne National Estuary Program.

Susan Testroet-Bergeron

An Educator's Guide to the Barataria-Terrebonne National Estuary
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Estuary Activities

Section 1: Habitat

Sediment loss, in conjunction with the natural sinking of the marsh, is by far the most significant problem in the estuary. Sea-level rise and erosion also contribute to the problem, as can human activities such as canal dredging and construction of navigation channels.

Section 2: Changes in Living Resources

Approximately 735 species of birds, finfish, shellfish, reptiles, amphibians, and mammals spend all or part of their life cycle in the estuary. Several of the species are either categorized as threatened or endangered.

Section 3: Water Quality

Hydrological modifications are considered the "linchpin" problem of the basins, meaning that they affect all of the basins other problems. When we build levees, dredge canals, or cut through natural ridges, the natural flow of water is changed.

Section 4: Cultural Heritage

602,000 people who live in the estuary trace their heritage to several continents, they share a common love of this land.

Section 5: Economic Development

Some estuarine goods are assigned values in the economic marketplace, such as the products of the commercial fishing, hunting, and trapping, and aquaculture industries. Other estuary services, such as storm protection and tertiary wastewater treatment, are never explicitly purchased and thus are more difficult to value.

Maps

These resources may be used with a variety of lessons.

Louisiana Estuary Parishes
Louisiana Highways
Louisiana Land Loss Map – Prints 11" X 17"
Louisiana Parishes
Louisiana Rivers
The Barataria-Terrebonne National Estuary Habitats
The Barataria-Terrebonne National Estuary in Louisiana
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Thematic Map of the Barataria-Terrebonne National Estuary

Louisiana Standards

Supplemental Louisiana Grade Level Expectations (GLEs)

Note: The Barataria-Terrebonne National Estuary is often abbreviated BTNE

Welcome to the
Educator's Guide to the
Barataria-Terrebonne National Estuary

This project began under the vision and direction of Deborah Schultz, formal education coordinator for the Barataria-Terrebonne National Estuary Program. It was her vision to have a comprehensive group of lessons keyed to the important issues facing the Barataria-Terrebonne estuary. In 1998, a grant was awarded to a team of teachers under the direction of Ms. Valerie Butler. This team of teachers identified lesson ideas appropriate for inclusion into this guide. Dr. Pam Blanchard, Louisiana State University Department of Curriculum and Instruction, picked up the project in 2004 and began to edit, revise and reformat lessons to include in the project. When Deborah left the program to pursue other life goals, the guide was in its final stages of completion. Ms. Susan Testerot-Bergeron, the new formal education coordinator, along with Sandra Helmuth, BTNEP office coordinator, began the final formatting and editing process to publish the Guide in a PDF format online.

Lesson Sources. The lessons come from a number of products and the original sources have been noted when the information was available. Many of the activities came from an early unpublished BTNEP education product written by Paul Coreil and Dinah Maygarden. These lessons have been updated and reformatted to fit the guide. Dr. Blanchard created some lessons from ideas generated by 1998 grant team. Original authors are credited on individual lessons.

Guide Organization. The Educator's Guide is organized into five sections, with each section corresponding to an important issue facing the BTNEP – Habitat (Section 1), Changes in Living Resources (Section 2), Water Quality (Section 3), Cultural Heritage (Section 4) and Economic Development (Section 5). Each activity is an independent PDF file that can be downloaded from the activity matrix on the Guide webpage. Each section is numbered independently, so that new activities can be added to the guide as they are developed.

Grade Level of the Handbook Activities

Activity	#	K	1	2	3	4	5	6	7	8	HS Biol	HS Env Sci
Barrier Islands	1-1	■	■	■								
Where is the B-T Estuary?	1-2	■	■	■								
Habitat Lap Sit	1-3				■	■						
Wetlands in a Pan	1-4				■	■						
We Are Losing Our Wetlands	1-5				■	■						
Wetland Metaphors	1-6								■			
Estuary Ecosystems	1-7								■	■		
Wetland ECO-Bingo	1-8						■					
Wetland Field Trip	1-9						■		■			
Coastal Erosion: Making Sense …I	1-10				■	■	■			■		
Demonstrating Destruction	1-11				■	■	■			■		
Investigating Habitat Change	1-12						■			■		
Issue Analysis & Decision Making	1-13								■	■		■
Coastal Wetlands Needs YOU!	1-14			■	■		■		■		■	
The Tragedy of Isles Dernieres	1-15									■		■
A Bayou Journey in 1880	1-16						■					
The Great Marsh Dilemma	1-17								■		■	■
The Story of a Blue Crab	2-1			■								
Dress a Beaver	2-2		■									
Cajun Creole Meal	2-3				■							
Wetland Webs	2-4			■		■	■					
Marsh Food Web … Game	2-5			■		■	■					
Wetlands Loss = Fisheries Loss	2-6						■			■		
Nutria: Nutrition or Nuisance?	2-7					■	■					
Trading Spaces	2-8						■		■			■
What is Freshwater?	3-1	■	■	■								
The Ideal Filter	3-2						■		■			
The Hurricane's Coming	3-3									■		
Keep It Above Board	3-4			■	■	■						
Exploring the B-T Watershed	3-5									■		
Watershed Drainage…	3-6						■		■	■		
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Nutrients: Phosphorus Cycle	3-8					■			■		■	
The Effect of NO_3 on Plant Growth	3-9								■		■	
Measuring the Bayou's Vital Signs	3-10								■		■	
Swamp Sweep	3-11								■			
A Song on the Bayou	4-1				■	■						
Ask an Expert	4-2					■	■		■	■	■	
Weaving Our Wetland Economic	5-1						■		■			
Wetland Promotions	5-2						■					

Habitat

Activity 1-1

Barrier Islands

Focus/Overview
This lesson introduces students to how barrier islands protect coastal Louisiana from the winds and waves of storms. Students make predictions of how barrier islands affect wave action during a simulated storm.

BTNEP Connection
Habitat

Grade Level
K, 1, 2

Duration
30 minutes

Subject Area
science

Setting
classroom

Vocabulary
barrier island, hurricane, storm surge

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Learning Objectives
The learner will…
- identify the land and water in two models of a coastline with and without barrier islands.
- state how barrier islands protect the coast of Louisiana.

Louisiana Science Grade Level Expectations

K,1: GLE-3	Predict and anticipate possible outcomes (SI-E-A2).
K,1: GLE 8	Use a variety of formats to express ideas about demonstrations (SI-E-A6).
K: GLE 30	Distinguish between areas of Earth covered by land and water (ESS-E-A2).
2: GLE 4	Predict and anticipate possible outcomes (SI-E-A2).
2: GLE 9	Use a variety of formats to express ideas about demonstrations (SI-E-A6).
2: GLE 50	Describe ways in which habitat loss or change can occur as a result of natural events or human impact (SE-E-A5).

Materials List
- two estuary/barrier island models made from clay or play dough
- water in a pitcher (tinted blue, optional)
- electric fan
- journal
- Poster of the Barataria-Terrebonne National Estuary (see resource list)

Background Information
Barrier islands are islands of sand that lie just off the Louisiana mainland. These islands are very important in protecting the bays and mainland of Louisiana from hurricane and tropical storm damage. Healthy barrier islands form a physical barrier that slows the winds and waters of tropical storms and hurricanes. Hurricanes bring in large amounts of water and strong winds, which create a huge rise in the water called **storm surge**. Barrier islands are natural buffer islands that protect the property of coastal inhabitants by reducing the height of storm waters pushed inland.

Advance Preparation
1. Construct two models of the Barataria-Terrebonne Estuary. One model needs to have barrier islands – the other model should not have barrier islands. The models can be filled with blue water (optional).
2. Have an electric fan plugged in and ready to go adjacent to the models.

Procedure

1. Display the satellite image of the Barataria-Terrebonne Estuary. Do you know what an **estuary** is? (An estuary is a place where the water meets the sea or ocean.) If we look at the Barataria-Terrebonne Estuary from a satellite picture, we can see small islands south of the estuary. These islands serve a purpose. Can you think how these islands can help the estuary? *(These islands protect the bays and marshes from large waves and strong winds.)* These islands are known as **barrier islands**. They help protect the estuary and main land from storms, like hurricanes, in the Gulf of Mexico.
2. The teacher will show the students the two models of a coast – one with barrier islands and one without barrier islands. What is a scientific model? (A model is an example or representation of something we see in nature.) What are the differences between these two models of the coast? *(One has barrier islands, the other does not.)* What is used to represent the land? *(Land is represented by clay.)* What represents the Gulf of Mexico? *(The blue water inside the pan represents the Gulf of Mexico and bay waters.)* The model should be filled with water.
3. Ask students to predict what will happen when the fan is turned on in each model. Have them write their predictions for each model at the top of the blackline master sheet entitled **Importance of Barrier Islands (Blackline Master #1).** Have students share their predictions. Keep a tally of the student's prediction in columns on the blackboard.
4. Turn the fan on. What does the fan represent? *(A hurricane or tropical storm.)* Have student observe what happens in each of the models. Record the student observations in another chart on the board labeled OBSERVATIONS. Identify which predictions made in Step 3 were correct or incorrect. Have students orally summarize, or draw conclusions, what they learned from the demonstration. *(Students may conclude that without the barrier islands, there is nothing to stop water from moving far inland.)*
5. Lead students in a discussion of the importance of barrier islands in protecting the estuary. The islands help by creating a buffer to slow the wind and water that hurricanes and other storms push into the bays and onto the coast of Louisiana. What kinds of things do the barrier islands protect in the estuary? *(Barrier islands protect the marsh, fish, crabs, birds, flowers, wildlife, and humans.)*
6. Using the blackline master sheet entitled **Importance of Barrier Islands (Blackline Master #1)**, have the students write why barrier islands are important to Louisiana. Students may use inventive spelling. Ask students to illustrate their understanding of the importance of the barrier islands and to draw at least two animals that the barrier islands help to protect.
7. To close the lesson, the students will mix and share their writings and drawings with a friend. The friends will in turn share what they have learned with the entire class.

Assessment

The students will write and reflect about the importance of the barrier island to the barrier islands. The students will be able to use inventive spelling and their writing should have some type of colored illustration that includes at least two animals that the barrier islands help protect.

Blackline Master

1. **Importance of Barrier Islands**

Extensions

Language Arts:
The students will create a poem about the barrier islands and how they protect the estuary.

Math:
Students will observe a map of coastal Louisiana and count the number of barrier islands around the southern part of Louisiana. Students can list the barrier islands and then sort the islands by length.

The Arts:
Students will create their own Barataria-Terrebonne Estuary clay or play dough model.

Resource

Wright-Frierson, Virginia. 1998. **An Island Scrapbook: Dawn to Dusk on a Barrier Island.** Aladdin Library.

A beautifully illustrated picture book on the North Carolina barrier islands. The author and her young daughter describe the barrier island they spent the summer exploring. Reading level: Ages 4-8.

Blackline Master #1

Aerial photo of Grand Isle, Louisiana.

Name _____

Barrier Islands Protect Our Coast

Make your predictions.

What will happen when the fan blows on the model with barrier islands?	What will happen when the fan blows on the model without barrier islands?

In the box below, draw how barrier islands protect Louisiana's coast from storm winds and water. In your drawing, include at least two animals that the barrier islands protect.

Write how barrier islands help protect Louisiana's coast.

Habitat

Activity 1-2

Where is the Barataria-Terrebonne Estuary?

Focus/Overview
This lesson uses math to introduce students to area of the Earth covered by land and water including the Barataria-Terrebonne Estuary.

Learning Objectives
The learner will…
- distinguish between land and water on a globe.
- collect data on land/water proportion on a globe by randomly locating their thumb on a globe during a globe toss game.
- graph the class data from the globe toss game and create a circle graph.
- identify the location of marsh, major rivers, bays, barrier islands, and the Gulf of Mexico on an enlarged map and then on an individual map.

Louisiana Grade Level Expectations

K: GLE-30	Distinguish between areas of Earth covered by land and water (ESS-E-A2)
1: GLE-36	Locate and compare the relative proportions of land and water found on Earth (EES-E-A2)
1: GLE-8 2: GLE 9	Express data in a variety of ways.… (SI-E-A5, SI-E-B4)
2: GLE 37	Compare bodies of water found on Earth (ESS-E-A2)

BTNEP Connection
Habitat

Grade Level
K-2

Duration
40 minutes

Subject Area
science

Setting
classroom

Extension Areas
language arts, math, the arts

Vocabulary
estuary, marsh, barrier Island

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Materials List
Provide a list of supplies necessary to conduct the activity.
- Beach ball world globe
- Chart paper, overhead or blackboard
- Map of Louisiana enlarged onto a tablecloth (see advanced prep)
- Crayons
- Copies of the Blackline Masters #1, #3, #4 – one per student
- Copy of the Blackline Master #2
- Index cards (30 cards in all)

Background Information
There are many estuaries located around the world. These estuaries can be found in London, Cairo, Calcutta, and Shanghai. In the famous U. S., estuaries include examples such as Tampa Bay, Florida; Galveston Bay, Texas; and San Francisco, California. One of the most expansive estuaries is located at the mouth of the Mississippi River known as the Barataria-Terrebonne Estuary. This mixture of fresh and saltwater is home to many humans, plants and animals, and its eroding away. The estuary serves several important functions, such as commercial fishing, recreation area, storm buffer, and flood water storage.

Advance Preparation
1. The teacher will need to blow up the beach ball globe.

2. Prepare a circle graph (**Blackline Master #1**) so that it has enough subdivisions for each student in the class – then round up to the nearest tens digit. For example… if you have 23 students in the class – subdivide the circle graph into 30 (rounded up to the next tens place) slices.
2. Made an enlarged map of Louisiana on a tablecloth. Make sure the map is large enough for at least 12 students to work with. Mark and label the Mississippi River, the Atchafalaya River, the Red River, Bayou Lafourche, the Gulf of Mexico, Lake Pontchartrain.
3. The teacher will need to have copies of the **Blackline Master #1** (from Salt Marsh Habitat Coloring Book) for each student.
4. Label the index cards with a large r (for river), b (for bayou), l (for lake), G (for Gulf of Mexico), f (for freshwater), s (for saltwater) – you should have 5 sets of the six cards when finished. These cards will be used for the "mix and match" game later in the lesson.

Procedure

1. There is more water on the world than land. In fact, the surface of Earth is made up of 70% water and 30% land. As an opening activity, the teacher will throw a beach ball globe to students. The teacher will tally where the tip of the student's right thumb lands when they catch the ball – on land or in the water. Repeat this quickly until each student in the class has had a chance to catch the ball. Teacher may choose to divide the class into groups. On the worksheet, **How Much Water is on the Earth?** (**Blackline Master #1)**, have the students begin at the top and color in blue (for water) the same number of slices as they have tally marks for water. Students should color in the remaining slices brown (for land). Have the students compare their circle graph with the circle graph on the **Percent of the Earth Covered by Water and by Land (Blackline Master #2)**, which shows 70% water, 30% land.
2. Water is everywhere. There is freshwater, brackish water and saltwater. The teacher will question the students for examples of freshwater and saltwater. The teacher will have a floor map of Louisiana (enlarged map of Louisiana on a tablecloth). The students will walk down the Mississippi River through Louisiana and identify this as freshwater. Students will also step on bayous and lakes to identify freshwater. Then students will gather in the Gulf of Mexico to identify saltwater.
3. The students will play a game of "mix and match". Each student will be giving a card with one letter on each card. (ex. r-river, b-bayou, l-lake, G-Gulf of Mexico, f-freshwater, s-saltwater) Approximately 12 students could play at a time. These students would have to look at their card, comprehend the letter and what it stands for, and find it on the Louisiana map. This game can be repeated until all students have had a turn.
4. Using students holding the freshwater and saltwater cards from the "mix and match" game as models, the teacher will explain when freshwater from rivers and saltwater from the sea mixes it creates an **estuary**. One estuary that they could be representing located here in Louisiana is called the Barataria-Terrebonne Estuary. Estuaries are important because they help fishermen find food for us, protect us from hurricanes, allow us to hunt, and help hold water we do not need. In the Barataria-Terrebonne Estuary, these are areas known as **marshes**. Marshes can be made up of freshwater and saltwater, or a mix of both fresh and salt water. Where do you think the marshes are located? Far inland or near the coast? *(Near the coast.)* Look at the map of Louisiana. What is there to protect the marshes and the inland part of Louisiana from storms and hurricanes? *(Barrier islands)*
5. As a closing activity, the students will color a map showing the various types of marshes and water salinities (**What is an Estuary? Blackline Master #3**). As a follow up, students can also color the Barataria-Terrebonne Estuary map (**Where is the Barataria-Terrebonne Estuary? Blackline Master #4**). The students can display their color sheets around the map of Louisiana.

Blackline Masters

1. **How Much Water is on the Earth?**
2. **Percent of the Earth Covered by Water and by Land**
3. **What is an Estuary** (Salt Marsh Habitat Activity Book, p. 2)
4. **Where is the Barataria-Terrebonne Estuary?** (Salt Marsh Habitat Activity Book, p. 3)

Assessment

- Students should complete the circle graph about their thumb data and correctly label a map of the Barataria-Terrebonne Estuary, indicating whether water bodies are freshwater or saltwater.

Extensions

Language Arts:

Give students the outline map of Barataria-Terrebonne Estuary (Blackline Master #3). Allow students to use alphabet stamps to stamp the freshwater, saltwater, marshes, and barrier islands. Allow the students to only use the f, s, m, and b stamps. Students self correct on the teachers handout.

Math:

Set up a bucket with paper cutouts of fish and paper clips attached to them. The students will use a small pole with a magnet as bait. The students will fish. Each fish has a number on it. The students will have to match the number to a card with the corresponding number. (ex. 4 dots=4 one-to-one correspondent.)

The Arts:

The students can sing the song "Feliciana LeRoux" by J. Downing from the CD **The Gumbo Pot**. It's about a girl that is an alligator hunter and saves her grandpa from the alligator. Have students draw scenes from the song.

Resources

Tradebooks:

Fontenot, Mary Alice. 1985. **Clovis Crawfish and His Friends. (The Clovis Crawfish Series).** Pelican Publishing Company.

In the Louisiana bayou Clovis Crawfish tries to prevent M'sieu Blue Jay from making a meal out of his friend Gaston Grasshopper. Ages 4-8.

Dartez, Cecilia C. 2002. **L is for Louisiana**. Pelican Publishing Company.

This book is a wonderful chance for the students to experience Louisiana culture while identifying the alphabet. Ages 4-8.

Suzanne, Tate. 1996. **Perky Pelican: A Tale of a Lively Bird (Tate, Suzanne, Nature Series, No. 18)**. Nags Head Art.

This book tells a story about a pelican living in Louisiana. All ages.

Thomassie, Tynia. 1998. **Feliciana Feydra LeRoux: A Cajun Tall Tale**. Little Brown and Company.

This book tells a story of Feliciana, a young Cajun girl, who longs to go alligator hunting with her grandfather and brothers. One night she sneaks out and adventures follow. All ages.

Music:

Downing, Johnette. "Feliciana LeRoux" from the CD **The Gumbo Pot**.

This song is about a girl that is an alligator hunter and saves her grandpa from the alligator. A Silver Honors 1999 Parents' Choice Award winner. Visit http://www.johnettedowning.com/recordings.htm#gumbo_pot

Blackline Master #1

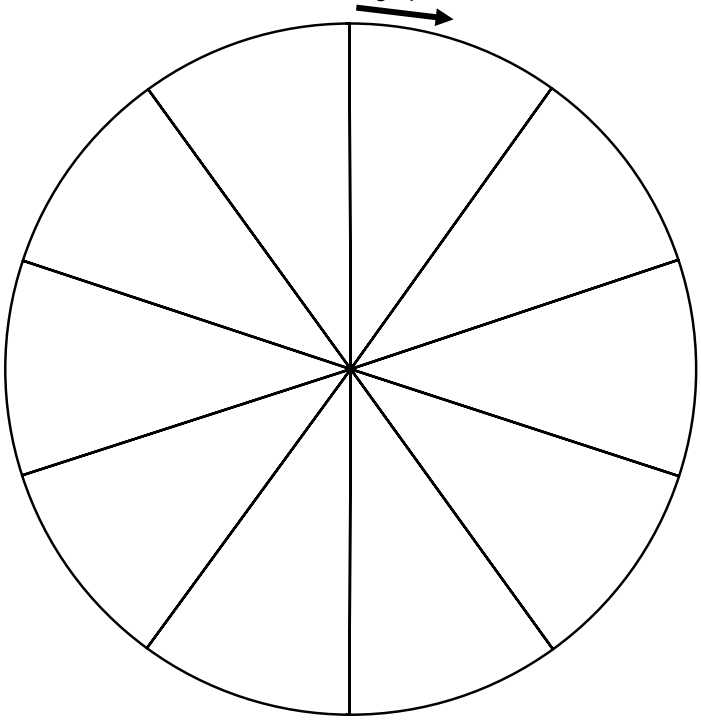
Name _____

How Much Water is on the Earth?

Directions: Count the number of tally marks that represent how many times thumbs touched water on the globe ball when you caught it. Start with the pie slice under the arrow and color in the same number of pie slices **blue**.

The Number of Times Our Thumbs Touched Water

Start your circle graph here!



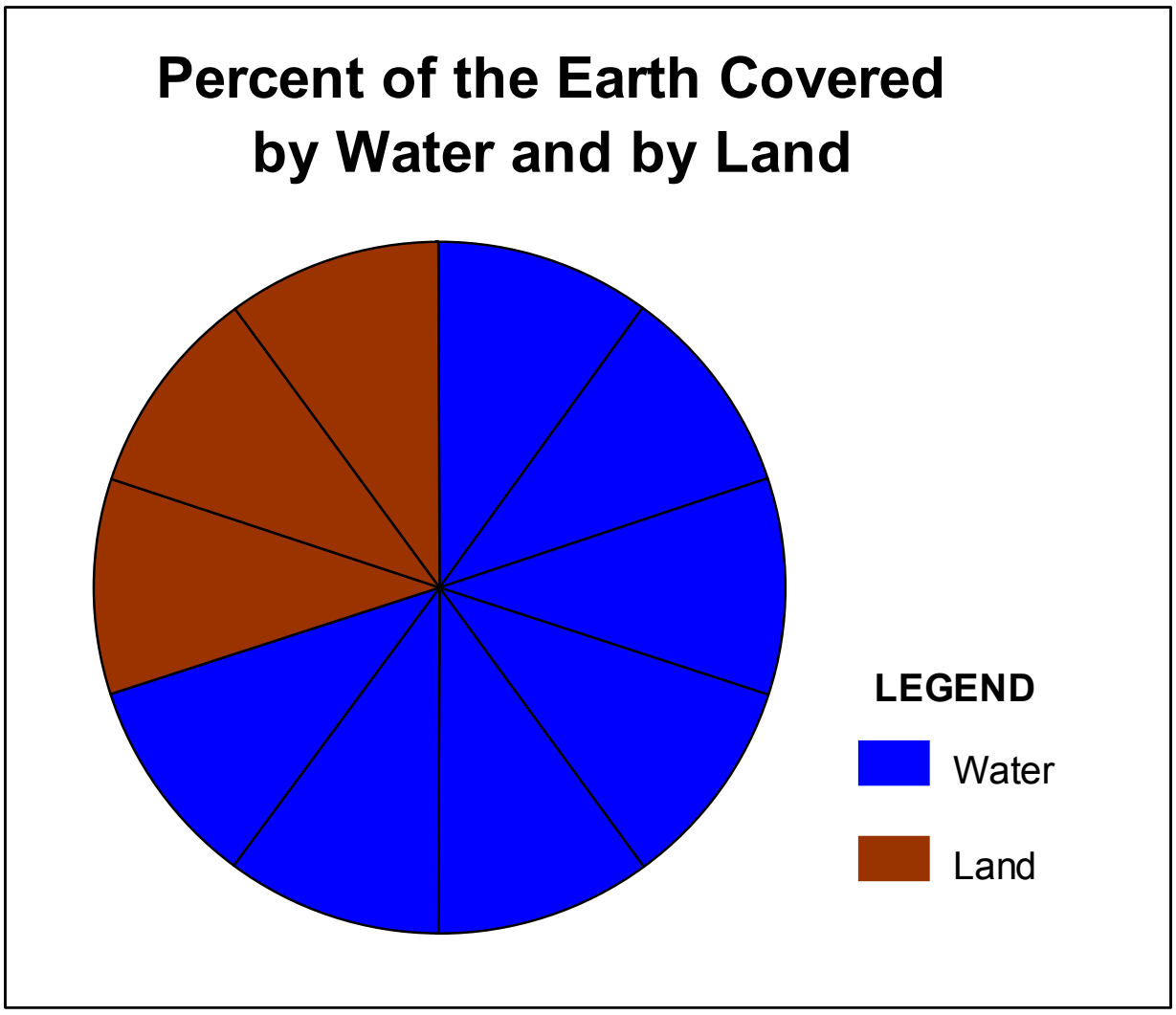
LEGEND

Water

Land

Blackline Master #2

Much of the Earth is covered by water.
The graph shows that 7 slices out of 10 are covered by water.
Only 3 slices out of 10 are covered by land.

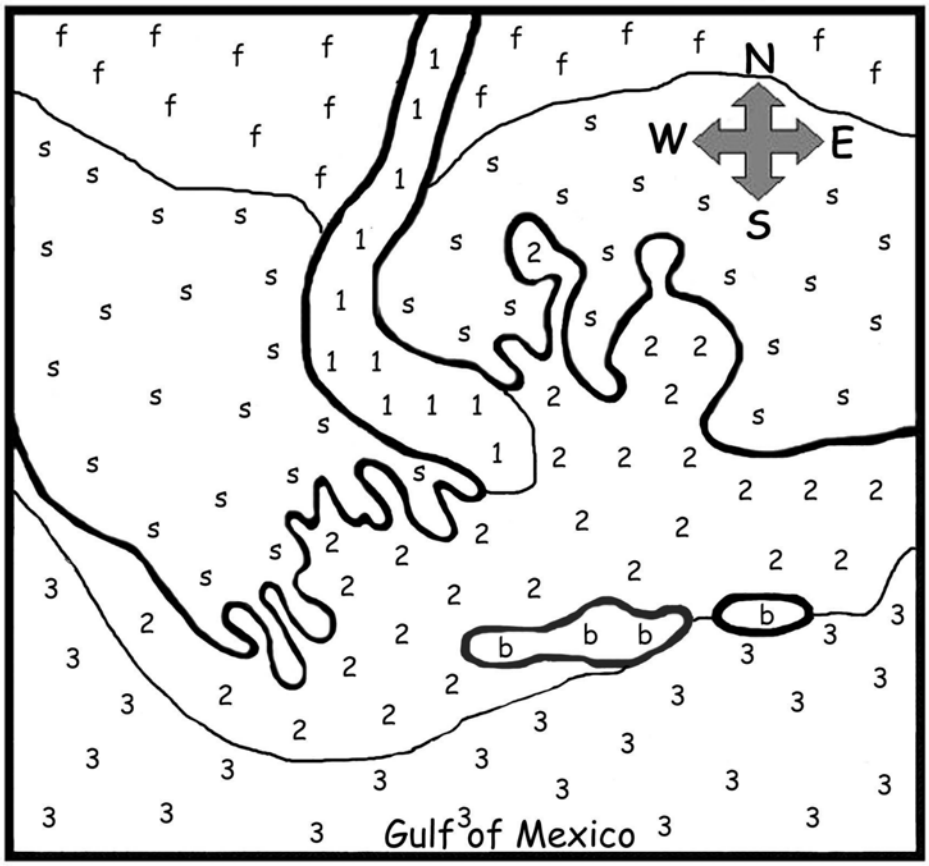


How close does your circle graph match the one above?

Blackline Master #3

Name _____

What is an Estuary?



An <u>estuary</u> is a place where freshwater and saltwater mix. The freshwater comes from rivers, bayous, and lakes. Saltwater comes from the ocean. The ocean near the Barataria-Terrebonne National Estuary is called the Gulf of Mexico.

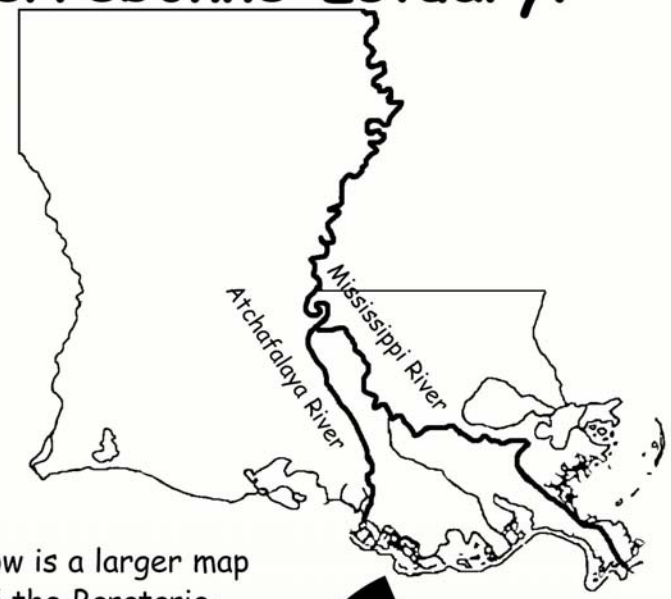
1	Color freshwater yellow	f	Color fresh marsh orange
2	Color estuary water green	s	Color salt marsh red
3	Color saltwater blue	b	Color barrier islands brown

Blackline Master #4

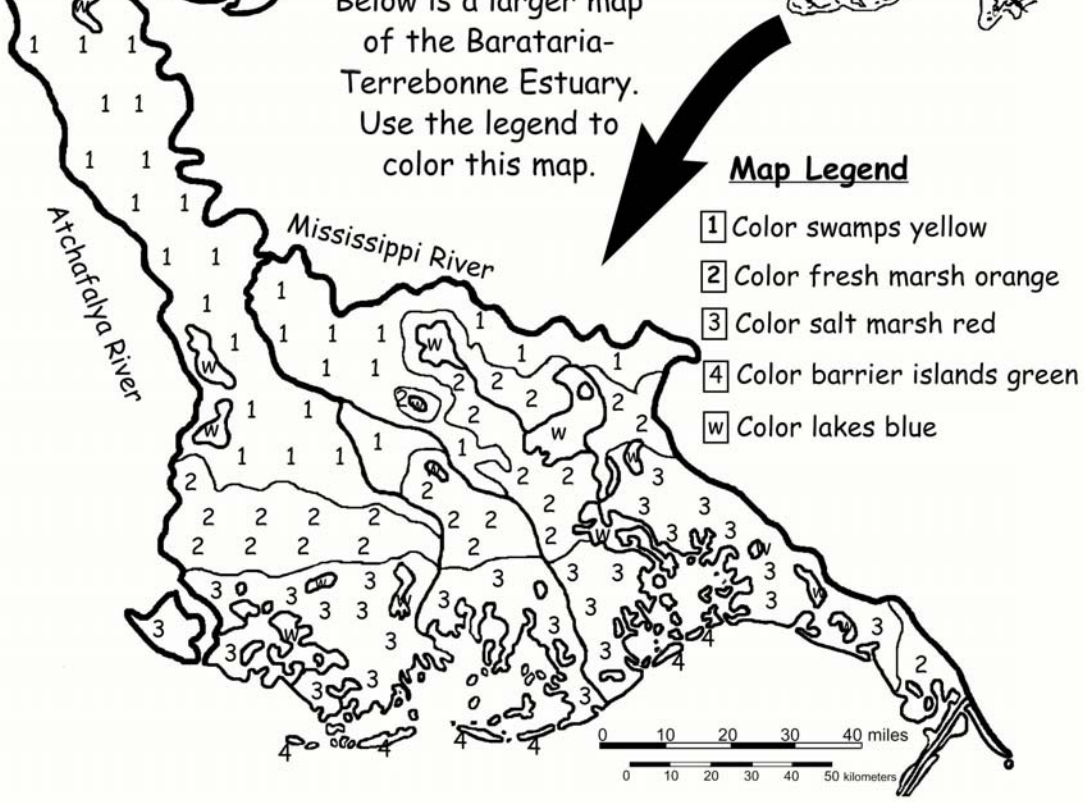
Name _____

Clawdette, Where Is The Barataria-Terrebonne Estuary?

My home is located in South Louisiana between the Mississippi River and Atchafalaya River. On the right is a map of Louisiana. Find my home and color it purple.



Below is a larger map of the Barataria-Terrebonne Estuary. Use the legend to color this map.



Map Legend

- 1 Color swamps yellow
- 2 Color fresh marsh orange
- 3 Color salt marsh red
- 4 Color barrier islands green
- w Color lakes blue

Habitat

Activity 1-3

Habitat Lap Sit

Adapted from *Project Wild* and
BTNEP/LSU AgCenter: *Wetland Functions, Values and Economic Resources*

Focus/Overview
This activity is a game that highlights the important parts of a habitat.

Learning Objectives
The learner will…
- identify the four components of a healthy habitat.
- understand that the success of an animal species depends on the correct proportion of all the necessary components of the habitat.
- recognize that all things are interrelated and that impacts on one habitat component affect all other components and occupants of the habitat.

Louisiana Grade Level Expectations

4: GLE-50	Explain how some organisms in a given habitat compete for the same resources (LS-E-C1).
4: GLE-54	Describe the effect of sudden increases or decreases of one group of organisms upon other organisms in the environment (LS-E-C3).
4: GLE 72	Predict and describe consequences of the removal of one component in a balanced ecosystem (SE-E-A2).

Materials List
- One copy of **Blackline Master #1**
- A large open space

Background Information
A **habitat** is a place in where a group, or **population**, of organism lives. A population is a group of living organisms of the same kind that live in the same place at the same time. For example, a marsh is a habitat for turtles, muskrats, crabs and egrets. Populations of organisms interact in the habitat and form a **community**. The community of living (**biotic**) organisms interacts with each other and the non-living (**abiotic**) world around it to form an **ecosystem**.

BTNEP Connection
Habitat

Grade Level
4

Duration
20 minutes

Subject Area
science

Setting
indoors or outdoors

Vocabulary
habitat, population, ecosystem, biotic, abiotic

Original Sources
Adapted from *Project Wild* and BTNEP/LSU AgCenter: *Wetland Functions, Values and Economic Resources*. Activity 2.

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Habitats very in size and can be shared with a number of different plants and animals. An aquarium is an example of a shared habitat, as is a terrarium. Both are places where several populations of animals and plants can coexist in the same habitat. The habitat must supply the needs of organisms that live in it, such as food, water, temperature, oxygen, and minerals. If the population's needs are not met, it will move to a better habitat. There are four main requirements for a healthy habitat for organisms: food, water, shelter and space. Different animals and plants require different amounts of all of these.

Habitats are important because they provide animals a place to live that meets all their requirements in order for them to survive and be healthy. Some organisms can live in a variety of habitats, while others need very specific conditions in order for them to survive and be healthy. The loss of habitats is one of the big reasons that cause animals to become endangered or extinct. Habitats are last for a variety of reasons including land lost and human overpopulation.

Advance Preparation

1. Read through the Habitat Lap Sit Script (**Blackline Master #1**).

Procedure

The procedure for the Habitat Lap Sit is detailed in **Blackline Master #1**.

Blackline Master

1. **Habitat Lap Sit Script**

Assessment

- Students should be able to give correct answers to the review questions at the close of the Habitat Lap Sit. Students could be asked to draw the four components of a healthy habitat for a swamp or marsh or barrier island.

Extensions

Science:

Have students visit the *In a Pinch Habitats Awareness* website (see Resources List). Students can prepare mini-reports about any of the different habitats described on the page.

Resources

BTNEP Resources:

Somers, Rachel. 2001. **Salt Marsh Habitat Activity Book.** Barataria-Terrebonne National Estuary Program.

Tradebooks:

Green, Jen. 1999. **A Dead Log.** Crabtree Publishing.

When the tree dies, a different group of animals and plants move in. A Dead Log describes the diverse kinds of insects, plants and animals that live on and under a dead tree's bark as well as inside the log itself. Reading level: Ages 9-12.

Hablitzel, Marie, and Kim Stitzer. 1999. **Animals & Habitats -- On Land, Ponds & Rivers, Oceans (Draw Write Now, Book 6).** Barker Creek Publishing.

Students get an overview of the variety of animal habitats on earth – land, freshwater, and saltwater – while drawing and writing about them. Reading level: Ages 5-10.

Relf, Patricia, and Nancy W. Stevenson. 1995. **The Magic School Bus Hops Home: A Book About Animal Habitats**. Scholastic.

When a bullfrog hops out of the classroom window, Ms. Frizzle and her students take a wild ride from a frog's-eye-view to learn about animal habitats in a book that complements the PBS animated series. Reading level: Ages 4-8.

Websites:

Lozinsky, Georgia 2002. **In a Pinch Habitats Awareness**, accessed June 4, 2004 at http://inchinapinch.com/hab_pgs/index.htm

A website featuring information on habitats. Detailed description, critical areas, reasons for habitat loss and some pictures. Of particular interest is the wetlands page. Ability level: Upper Elementary, Middle School.

Association of National Estuary Programs. 2003. **What's an Estuary?** accessed June 4, 2004 at http://whatsanestuary.com/tools.cfm

This website's goal is to make "estuary" an everyday household word, like "river" or "ocean" by the year 2005. They have a wonderful downloadable Quicktime movie on estuaries that is very well done. Ability level: Upper Elementary to High School.

Blackline Master #1

Habitat Lap Sit Script

What You Say	What You Do	What the Students Do
One of the uses for a wetland is as a place to live for many kinds of plants and animals. This is called a habitat. We are going to play a game to learn more about the parts that make up a habitat.		Students recall the parts of a habitat – food, water, shelter, and space.
I will assign you a number from one to four. I will point to each number and you will call our your number as we go. Remember your number! One – two – three – four – etc.	Using a permanent marker, right the numbers on a piece of masking tape and tape it to the student's shirt. All students should be assigned a number from one to four.	
All the "ones" are going to be **water**. All the "two's" are going to be **food**. All the "three's" are to be **shelter**. All the "fours" are to be **space**.	When students are all numbered, send all the "ones" to one corner, all the "twos" to another corner, etc.	
Now one person from each group should come to the center. All four of you must stand side by side in order: one, two, three, four. Now one more person from each group repeats the process. We'll form a circle with everyone standing side by side, shoulder to shoulder. Now, everyone turn to the right. You should be looking at the head of the student in front of you. Now take a step toward the center of the circle.	Mark a central area for the activity with a piece of chalk, yarn, etc. Bring the students into the circle four at a time until they are all in the circle.	Students form a circle, standing side by side.
Now listen carefully! Everyone place your hands on the waist of the person in front of you. At the count of three, slowly sit so you are sitting on the knees of the person behind you and supporting the person in front of you on your knees.		
Now what are you representing?	If they need prompting, tell the students they are representing a habitat in which all the components are in the correct arrangement, so it is well-balanced. Habitats provide the animals that live in them with a balance of water, food, shelter and space.	Students reply that they are representing a habitat in which all the components are present in the correct arrangement.

What You Say	What You Do	What the Students Do
OK, now you can relax! Try to move the circle slowly by taking a small step. What happens?	After the circle has collapsed, discuss in more detail what a balanced habitat is, why it is needed for the survival of the species occupying it, etc.	Students sit or fall down.
Now let's form the circle again, the same as before.	Repeat the process of forming the habitat lap-sit circle.	Students form the lap-sit circle again.
This time things are not so good in our habitat. There's a problem because of a lack of fresh water. If you are a "water," let go and sit down on the ground.		The "water" components remove themselves and the circle collapses.
What happened? The habitat couldn't keep itself balanced when the water was removed. What do you think would happen to the animals that live in the habitat? Suppose it was a swamp habitat where animals like fish, frogs, crawfish, herons, lived? All these animals depend on food, water, shelter, and space being balanced. What would happen to these animals? Let's form the circle again.	As the "waters" leave the circle, the circle will collapse. Repeat the process of forming the habitat lap-sit circle.	
This time most of the marsh plants are removed from the habitat. What parts of the habitat might change because of this: food, water, shelter, space? One "shelter" and one "food" need to leave the circle. What happened this time? How did this change our habitat? Let's form the circle one more time.	One "shelter" and one "food" leave the circle. The circle either collapses or becomes unbalanced. Repeat the process of forming the habitat lap-sit circle.	The students report what happened to the circle. They explain what this would mean to the habitat and what things live there.
What would happen to our habitat if a nutria came along and ate all the food (marsh grass) in the habitat? What happened to our circle? What would all the other animals that need marsh grass as food?	Have all the "foods" leave the circle. The circle again collapses.	Students should respond that the components would be out of balance and the habitat would be unhealthy or collapse. Animals compete for the same food source – so animals that also need marsh grass to survive would have to move or would die of starvation.

What You Say	What You Do	What the Students Do
Let's review what we did and what happened. 1. What are the four parts of a healthy habitat? 2. What happened when we first made the circle and did the "lap sit"? 3. What did the balance tell us about a habitat? 4. What happened to our habitat when we removed a component like when we removed all the marsh grass because nutria ate it all? What happened to the other animals that needed marsh grass as food? 5. When one of the parts of a habitat is removed, how does it change the habitat?		1. The four parts of a healthy habitat are food, water, space and shelter. Each part of a habitat can't lap-sit alone. 2. All the parts of the habitat depend on one another. 3. All parts of the habitat are necessary for the habitat to be healthy and balanced. 4. When a part is taken away, the habitat becomes unhealthy – out of balance. 5. The habitat can't support the plants and animals that want to live there.

Habitat

Activity 1-4

Wetland in a Pan

Focus/Overview
In this lesson the teacher demonstrates the functions of a wetland using a home-made model. Students then design their own wetland models, test them, and evaluate them for efficiency.

Learning Objectives
The learner will…
- describe the importance of wetlands in flood control.
- appreciate the ability of wetlands to filter sediment and other pollutants.
- describe how wetlands help to control shoreline erosion.

Louisiana Grade Level Expectations

3: GLE-11 4: GLE-12	Use a variety of appropriate formats to describe procedures and to express ideas about demonstrations or experiments (SI-E-A6).
4: GLE-18	Base explanations and logical inferences on scientific knowledge, observations, and scientific evidence (SI-E-B4).
3: GLE-61	Explain how selected animals once classified as endangered have recovered (SE-E-A5).
3: GLE-62	Identify animals in Louisiana that have recovered and that are no longer considered endangered (SE-E-A5).

BTNEP Connection
Habitat

Grade Level
3, 4

Duration
Two or three 45-minute class periods

Subject Area
science

Setting
classroom or outdoors

Extension Areas
language arts, math, social studies, science, the arts

Vocabulary
wetland, buffer zone, erosion, sediment, pollution, nutrients, endangered species, threatened species

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

Background Information
The wetlands of the Barataria-Terrebonne Estuary perform many functions which are valuable to us. Some of these functions are wildlife habitat, water quality protection, storm buffer, erosion control and flood control.

Louisiana **wetlands** are important **wildlife habitat** for at least 50 game and fish species and countless numbers of birds, mammals, fish, reptiles and amphibians, not to mention all the insects and other invertebrates that live within our wetlands. Some of these animals are not year-round residents of our wetlands, but only visit our wetlands on their way to wintering grounds in South and Central America, such as the prothonotary warbler, a migratory songbird.

There are 20 animals, including invertebrates, fish, amphibians, reptiles, birds and mammals, and 3 plants that are listed as threatened or endangered in Louisiana by the U.S. Fish and Wildlife Service and the Louisiana Department of Wildlife and Fisheries Natural Heritage Program (see **Blackline Master #3**). An "**endangered**" species is one that is in danger of extinction throughout all or a significant portion of its range. A "**threatened**" species is one that is likely to become endangered in the foreseeable future. Large mammals such as the Louisiana Black Bear and the Florida Panther are threatened because humans are putting houses and stores on land that these animals once had all to themselves.

Wetlands are also very important in helping to maintain good water quality in the coastal zone. Wetlands **filter** water by **removing excess nutrients and chemical pollutants**, functioning much like a large (and

natural) tertiary water treatment system. Wetland plants remove nitrogen and phosphorous (from fertilizer runoff into rivers), reducing pollution problems in groundwater, the dead zone and nearby lakes, streams and estuaries. Wetlands also **trap sediment** in water flowing through the wetlands and prevents this excess sediment from polluting water bodies lying downstream. In the process, these sediments help build and maintain the wetlands, keeping it healthy.

Wetland plants help protect the coast by becoming a **buffer zone** between storm waves and the fragile coast when tropical storms or hurricanes come ashore. Research has shown that for every 2.7 miles of healthy wetlands, storm surge height can be reduced by one foot. Healthy wetland plants help **control soil erosion** and hold together the banks of coastal lakes and streams, as well as the fragile beach dunes on our barrier islands and beaches.

Wetlands provide **natural flood control** by slowing floodwaters, which reduces the amount of damage a flood can do, as well as allowing the flood waters to collect in the wetlands, which reduces the peak of the flood waters.

Activity 1. Wetlands in a Pan (Teacher Demonstration)

Materials List

- large baking pan or paint pan
- scraps of indoor-outdoor carpeting, florist's "oasis" foam
- modeling clay or Play Doh
- watering can with sprinkler
- spray bottle (or milk jug with holes punched in the sides)
- about 1 cup of soil
- electric fan
- 1 packet of sugar free Kool Aide

Advance Preparation

1. Make a model (Option: Borrow an Enviroscape Model; see Extensions)
2. To make a wetland in a pan model, prepare in advance:
   - Spread modeling clay over upper half of the pan (representing land) letting it slope gently toward the center of the pan. Smooth the clay at the edges of the pan to seal.
   - Cut the carpet of florist's foam (represent the wetland buffer) to fit about one-fourth of the rest of the pan. Place this piece adjacent to the clay. Try to get as tight a fit as possible between the clay and carpet (representing a smooth transition from dry land to wetland).

Procedure

1. Use the Wetland in a Pan script to guide the activity (**Blackline Master #1**).

Activity 2. Wetland Ecosystems in a Box (Student-built)

Materials List

- large shoebox (one per group)
- scraps of indoor-outdoor carpeting, florist's "oasis" foam
- modeling class or Play Doh
- construction paper

Advance Preparation

1. Obtain items in Materials list for each student group to make a model of a wetland.
2. Protect table surfaces and floor with large drop cloth, or make arrangements to perform this lesson outdoors.
3. Assemble materials for each student group in designated work area for each.

Procedure

1. Instruct students to design their own wetland ecosystem model using the "Wetland Ecosystem in a Box" (**Blackline Master #2**).
2. Have groups volunteer or select groups to report on one of the endangered animals or plants they selected to be represented their wetland model to classmates.

Blackline Masters

1. **Wetland in a Pan Script**
2. **Wetland Ecosystem in a Pan Instructions**
3. **Endangered or Threatened Species of Animals and Plants in Louisiana**

Assessment

- Students should be able to build a model of a wetland in a box and accurately relate what the specific parts of their model represent. They can give oral reports about their endangered wetland animal or plant and should be able to tell something of the life history of the organism, why the organism is endangered in Louisiana and in what specific habitat the organism makes its home.

Extensions

Language Arts:

"Travelogue of a Raindrop" After the wetland-building activity, have students close their eyes and visualize themselves as the rain falling onto the wetland. Each student is a droplet of the rain, and each should describe his/her journey through the wetland: the scenery, the people and animals they meet, the path they take, the length of the journey in distance and time. The students can record their journey on audio tapes, make a travel brochure, write a postcard home to their parents.

Social Studies:

"Mapping the Journey of a Raindrop" Students can be shown a local map with the location of their school marked as well as the local wetland areas, bayous, lakes, rivers, etc. Given a copy of that map, they can then trace the journey of a raindrop falling on their schoolyard through the local wetlands, marking the journey with crayons or markers. Post the maps of their travels on the classroom wall so that the students may view all the possible routes and discuss.

Math:

Place a measured amount of water into the watering can to simulate rain. In the Wetland in a Pan model, pour out the measured amount of water in a shower. Wring out the sponge "wetland" into the original measuring cup and have students record *how much* water was absorbed by the wetland. Start with a dry wetland (dry sponge) and repeat with an already wet wetland (sponge). Compare the data.

Using the Wetland in a Pan model, use a timer to measure the amount of time it takes for the water to complete its flow to the "Gulf" with a wetland and without a wetland.

The Arts:

Students may illustrate the journey of a raindrop by dramatizing it in a brief performance: a one-act play; creating and performing a song or poem. They may also create a game or illustrate the travel brochures designed by other students.

Science:

Borrow an Enviroscape Model from your parish Louisiana Cooperative Extension Service office. Use sponges to simulate areas of wetland near the lake or ocean on the model. Create a "rainstorm" using a water sprinkler bottle. Show how the sponges are able to absorb much of the water, while without the wetland areas, the water levels in the lake and other water bodies rise more quickly, and flooding is more likely.

Resources

BTNEP Resources:

Somers, Rachel. 2001. **Salt Marsh Habitat Coloring Book.** BTNEP.

Tradebooks:

Bernhard, Annika. 1994. **Wetland Plants and Animals Coloring Book.** Dover Publications.

Over 40 images of plants and animals of the northeast United States and Canada. Each picture with a descriptive caption. Reading level: Ages 4-8.

Galko, Francine. 2002. **Wetland Animals.** Heinemann Library.
Describes wetlands, the different kinds of animals that can be found in them, and their ecological importance. Reading level: Ages 4-8.

Kalman, Bobby. 2002. **What are Wetlands?** Crabtree Publishing.
Investigates some types of wetlands, including swamps, salt marshes, bogs, and flood plains; the many plants and animals that live in wetlands; and the threats to these ecosystems. Reading level: Ages 4-8.

Keller, Holly. 1994. **Grandfather's Dream.** Greenwillow.
Nam lives with his parents, his grandfather, two lively puppies, and assorted other animals in a small village in the Mekong delta. Before the Vietnam War, this area was home to the Sarus crane. The Vietnam war is over, and Grandfather and young Nam dream that the new dikes will restore the wetlands, bringing home the beautiful cranes that once filled the winter sky. Reading level: Ages 4-8.

McLeish, Ewan. 1995. **Wetlands (Habitats).** Thompson Learning.
A geography book on the world's wetlands showing how they are formed, why they are important, and what can be done to safeguard them for the future. Reading level: Ages 9-12.

Posters:

U.S. Fish and Wildlife Service. 2003. **Working Together: Partnerships for Endangered Species Recovery poster**.
A beautifully illustrated poster on partnerships that are working together to protect endangered species from across the United States. The poster can be downloaded [http://endangered.fws.gov/partners/poster] or obtained by writing: Chief, Division of Endangered Species, U.S. Fish and Wildlife Service, 1875 Century Blvd., Suite 200, Atlanta, GA 30345. Visit http://southeast.fws.gov/es/T&E%20Species.htm

Websites:

Louisiana Department of Wildlife and Fisheries. **Species Listed as Threatened, Endangered & Candidate in Louisiana.** Accessed September 20, 2005 at http://www.wlf.state.la.us/apps/netgear/index.asp?cn=lawlf&pid=693

References:

Kurpis, Lauren. 2002. **Endangered Species In Louisiana.** Accessed June 4, 2004 at http://www.endangeredspecie.com/states/la.htm.

U.S. Fish and Wildlife Service's. 1999. ***Endangered and Threatened Wildlife and Plants List***. Accessed June 3, 2004 at http://endangered.fws.gov.

Coreil, Paul. 1998. **Wetlands Functions and Values in Louisiana**. Louisiana State University AgCenter Publication 2519. From http://www.lsuagcenter.com/nav/publications/wetlands_wildlife.asp.

Blackline Master #1

Wetland in a Pan Script

Scientists use models to help understand something they are interested in. Today we are going to work with a model of a wetland ecosystem.

UNDERSTANDING PARTS OF THE MODEL

➔ SHOW PREPARED MODEL.

Inside this pan is a representation or model of the wetlands. I've put clay in the upper half. What do you think the clay represents? *(land)*. What do you think the water represents? *(Gulf of Mexico; ocean)*. What do you think the carpet represents? *(wetlands or plants of wetlands)*.

Between the land and the water is an area called a wetland. Wetlands are valuable in a number of important ways. Let's take a look at one way they help us.

WETLANDS FUNCTION: FLOOD CONTROL

First, we are simply going to make a heavy rainfall on the land. Where do you predict the water will go?

➔ ASK FOR A VOLUNTEER TO MAKE "RAIN" USING A WATERING CAN.

What did you observe happen? Where did the "rainfall" go? *(Much of the water seeped through into the "Gulf," but some was absorbed by the "wetland")*

Was your prediction correct? Did all the water end up in the "Gulf"? *(No, the wetlands absorbed some of the water.)*

➔ REMOVE THE "WETLAND" AND SQUEEZE THE WATER OUT TO SHOW HOW MUCH WAS ABSORBED.

Now let's take out our "wetland" and see what happens to the rainfall when the wetland is not there. What do you predict will happen?

➔ GET A VOLUNTEER TO MAKE ANOTHER RAINFALL ON THE LAND.

Did the water flow at the same speed this time? Did the "Gulf" fill at the same speed? (*No, the water flowed more quickly and the "Gulf" filled up faster.)*

So how do wetlands help with flood control? (*Wetlands allow flood waters to pond in an area that is already wet - helps prevent serious flooding in residential areas. Also, most of the water was slowed down by passing through the wetlands, reducing the amount of damage that fast water causes to homes, roads and businesses.)*

➔ POUR THE WATER OUT OF THE MODEL AND REPLACE THE "WETLAND."

WETLANDS FUNCTION: POLLUTION, SEDIMENT AND NUTRIENT REDUCTION

➔ SPRINKLE A POLLUTANT (A SMALL AMOUNT OF SUGAR FREE KOOLAIDE) ONTO THE "LAND."

What happens to pollution on the ground when it rains heavily? *(Pollutants get washed off the surface in runoff when it rains.)*

Can you predict what will happen in our model when we have a heavy rain? Where will the pollutants end up? *(The rain will carry the pollutants in the rain water down to the rivers and eventually to the Gulf of Mexico. Some of the pollutants will be retained in the wetlands.)*

Was your prediction correct?

➔ REPEAT THE DEMONSTRATION WITH THE SOIL AFTER REMOVING THE "WETLAND" TO CONFIRM THE PREDICTION.

If we remove the wetland, what differences would we see? *(All the excess nutrients, pollutants and sediment runoff will end up in the "Gulf." Pollutants such as oil, sewage, pesticides, and fertilizers may also be present in the runoff water.)*

Can the wetland also trap some of the pollutants? *(Yes. Wetland plants can absorb large amounts of nutrients from fertilizers and that chemical and biological processes in the wetland soil can break down some chemical pollutants into less harmful compounds.)*

Wetlands provide one of the most **efficient water purification** processes. Sometimes wetlands are used to complete the purification process at manmade water treatment facilities, because they do the job as well as artificial treatment and cost less. *As the water runs over the land, many pollutants are picked up. The wetlands absorb the flood waters and filter out many of these harmful pollutants before they can reach the ocean.*

WETLANDS FUNCTION: STORM WAVE BUFFER and EROSION CONTROL

Another function of wetlands we can demonstrate with this model is **erosion control**. On the banks of a bayou or lake, the waves from boat wakes and stormy weather can erode the bank quickly. How do people prevent erosion of their property if they live on the bayou or on the lake? *(People sometimes build bulkheads; others plant trees and other vegetation.)*

Blackline Master #1 – pg 2

Have you seen places along the bayou where people plant trees and grass and put up a notice saying "Do Not Spray" so the parish doesn't kill the vegetation? They know the value of wetland vegetation in erosion control.

➔ REMOVE THE WETLAND (CARPET) AND PLACE MUD ALONG THE EDGE OF THE LAND.

Ask students to predict what will happen to the muddy coastline when waves hit it. *(The mud will wash into the water, simulating shoreline erosion.)*

➔ CREATE WAVES BY HAVING AN ELECTRIC FAN BLOW ACROSS THE WATER TOWARD THE LAND.

If we put the wetland back in the pan and make waves again, will the erosion be as bad? *(No. The wetland is tougher than just dirt and will buffer erosion by the waves and prevent erosion.)*

WETLANDS FUNCTION: HABITAT FOR WILDLIFE

Why is it so important to keep our wetlands healthy? *(Healthy wetlands protect the animals and plants, including humans.)* What happens to the plants and animals that live in a wetland when the wetland is not healthy? *(The animals will have to find another place to live. The plants might die.)*

In the real world, humans have figured out ways to remove wetlands by draining them and/or filling them in. In the real world, what problems might arise if wetlands are removed? *(All the water and pollution would run straight to the ocean. There would be nothing between the coast and large storm waves. The animals and plants that live in the wetland habitat would have to move out or die.)*

Does anyone know what "endangered" means? *(Yes. It refers to plants and animals that are having trouble surviving in their habitats. They are having so much trouble – they are in danger of becoming **extinct**. Threatened means that the species might become endangered in the near future.)*

Let's look at a list of animals and plants that are on the endangered or threatened list here in Louisiana. (**Blackline Master #2**). Does anyone recognize the names of some of these animals?

Why do you think these animals and plants are on the list?

With a pencil, let's mark the endangered or threatened animals on the list that might live in a coastal wetland.

Blackline Master #2

Wetland Ecosystem in a Pan Instructions

Make your wetland model.

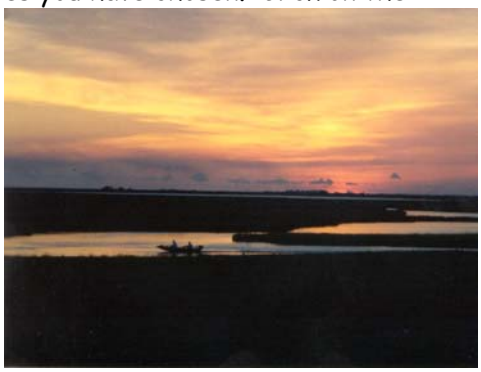
1. To create land, spread the modeling clay over one-half of the pan, letting it gently slope toward the center of the pan. Smooth the clay at the edges of the pan to seal.

2. Select a piece of carpeting, foam, or sponge to represent the wetlands. It should to fit about one-half of the rest of the pan. Try to get as tight a fit as possible, with a smooth transition from dry land to wetland.

3. Use construction paper or modeling clay to represent the ocean or Gulf of Mexico.

4. Add wetland animals and plants to your wetland ecosystem.
   - For animals: Make paper cut-out animals and color them with markers. Or perhaps you would like to make clay or Play Dough models. You can also look through old magazines to find pictures of animals that might live in Louisiana wetlands. You can carefully cut these pictures out of the magazine (get permission from your teacher or parents first!) and then glue it to some construction paper. You can trim the construction paper and then tape your animal to a toothpick and stick the end of the toothpick in the clay to stand the model up.
   - For plants: here are some fun suggestions for some wetland plant species.
     - cattails – use cotton swabs, painted brown and green
     - rushes – use pine needles
     - spartina – use a narrow-leaf lawn grass like crab grass or Bermuda
     - cypress trees – a twig draped with a little Spanish moss

5. Choose at least two threatened or endangered animals or plants in Louisiana that lives in a wetland ecosystem to include in your Wetland Ecosystem in a Box. Be sure that they can be found in the coastal wetland ecosystem you are constructing.
   - Find a picture of the animal or plant (visit the U.S. Fish and Wildlife Service's website [http://endangered.fws.gov/wildlife.html] to find out more information about your two animals or plants. Scroll to the bottom of the page and click on the appropriate animal group (mammal, bird, etc.) Then look for the species you have chosen. Click on the scientific name and it will take you to a page full of information, pictures and videos about the species you have selected.
   - Prepare a one page report about each of your two species. Give a description of your species and include a picture if you can find one. Tell why your species is threatened or endangered. Tell what part of Louisiana (parish) your species lives in and what habitat or ecosystem they are part of.



Sunset over a south Louisiana marsh.

Blackline Master #3

Endangered and Threatened Animals and Plants of Louisiana

Status	Animal (24 species)	Group (Habitat)
E	Crane, Whooping (*Grus americana*)	**bird** (salt marsh and coastal prairie)
E	Curlew, Eskimo *(Numenius borealis)*	**bird** (migratory bird)
E	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)	**bird** (quiet coastal areas, rivers or lakeshores with large, tall trees)
E	Pelican, brown (except U.S. Atlantic coast, FL, AL) (*Pelecanus occidentalis*)	**bird** (shallow estuary waters and coastal wetlands)
E	Prairie Chicken, Attwater's Greater *(Tympanuchus cupido attwateri)*	**bird** (tall grass coastal prairies)
E	Tern, least (interior population) (*Sterna antillarum athalassos*)	**bird** (coastal wetlands and beaches)
E	Warbler, Backman's *(Vermivora bachmanii)*	**bird** (low, wet forested wetlands)
E	Woodpecker, ivory-billed (*Campephilus prinicpalis*)	**bird** (upland forests)
E	Woodpecker, red-cockaded (*Picoides borealis*)	**bird** (old growth pine forests)
T	Heelsplitter, Alabama or "inflated" (*Potamilus inflatus*)	**clam** (freshwater streams in eastern Louisiana)
E	Mucket, pink or pearlymussel (*Lampsilis abrupta*)	**clam** (upper Mississippi River)
T	Pearlshell, Louisiana (*Margaritifera hembeli*)	**clam** (freshwater streams in central Louisiana)
T	Sturgeon, Gulf (*Acipenser oxyrinchus desotoi*)	**fish** (Gulf of Mexico)
E	Sturgeon, pallid (*Scaphirhynchus albus*)	**fish** (Gulf of Mexico)
E	Beetle, American burying (giant carrion, *Nicrophorus americanus*)	**insect** (undisturbed areas)
T	Bear, Louisiana black (*Ursus americanus luteolus*)	**mammal** (bottomland hardwood forests)
E	Manatee, West Indian (*Trichechus manatus*)	**mammal** (shallow salt and freshwater; estuaries)
E	Panther, Florida (*Felis concolor coryi*)	**mammal** (upland forests and wetlands)
T	Sea turtle, green (except where endangered) (*Chelonia mydas*)	**reptile** (Gulf of Mexico)
E	Sea turtle, hawksbill (*Eretmochelys imbricata*)	**reptile** (Gulf of Mexico)
E	Sea turtle, Kemp's ridley (*Lepidochelys kempii*)	**reptile** (Gulf of Mexico)
E	Sea turtle, leatherback (*Dermochelys coriacea*)	**reptile** (Gulf of Mexico)
T	Sea turtle, loggerhead (*Caretta caretta*)	**reptile** (Gulf of Mexico)
T	Tortoise, gopher (W of Mobile/Tombigbee Rs.) (*Gopherus polyphemus*)	**reptile** (well-drained sandy soils; pine forest)
T	Turtle, ringed map (*Graptemys oculifera*)	**reptile** (wide rivers)
E	Whale, sperm *(Physeter macrocephalus)*	**mammal** (Gulf of Mexico)
E	Whale, sei *(Balaenoptera borealis)*	**mammal** (Gulf of Mexico)
E	Whale, blue *(Balaenoptera musculus)*	**mammal** (Gulf of Mexico)
E	Whale, finback *(balaenoptera physalus)*	**mammal** (Gulf of Mexico)

Status	Plants (4 species)	Group (Habitat)
E	Quillwort, Louisiana (*Isoetes louisianensis*)	**fern** (sand and gravel bars in rivers)
T	*Geocarpon minimum* (No common name)	**flowering plant** (most sandy soil; north LA)
E	Pondberry (*Lindera melissifolia*)	**flowering plant** (coastal wetlands & ponds)
E	Chaffseed, American (*Schwalbea americana*)	**flowering plant** (open sandy soils of moist pine flatwoods)

E= Endangered T = Threatened

Information from the LA Wildlife and Fisheries Natural Heritage Program's *Louisiana's Rare Animals of Conservation Concern* (June 2004) and the U.S. Fish and Wildlife Service's ***Endangered and Threatened Wildlife and Plants List*** (December, 1999).

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.

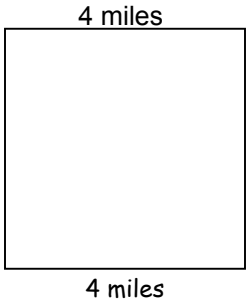
Sutcliffe, Andrea. 2002. **The New York Public Library Amazing US Geography: A Book of Answers for Kids.** Wiley.

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?

Habitat

Activity 1-6

Wetland Metaphors

Adapted from *Aquatic Project WILD* and
BTNEP/LSU AgCenter: *Wetland Functions, Values, and Economic Resources*

Focus/Overview
Students use familiar objects as metaphors to simulate wetland functions.

Learning Objectives
The learner will…
- describe the characteristics of a wetland.
- identify the ecological functions of a wetland.
- use metaphors to describe the functions of a wetland.

Louisiana Grade Level Expectations (Science)

7: GLE-35	Identify resources human derive from ecosystems (SE-M-A1).
7: GLE-36	Distinguish the essential roles played by biotic and abiotic components in various ecosystems (SE-M-A1).

Louisiana Grade Level Expectations (ELA)

7: GLE-21 8: GLE-21	Develop writing using a variety of literary devices, including analogies, symbolism and puns (ELA-2-M5).

Materials List
- pillow case
- sponge
- small pillow
- egg beater(or whisk)
- cradle
- soap
- coffee filter
- pack of antacid tablets
- small box of cereal
- small wetland animal toy (or picture)
- strainer
- *BTNEP's Portrait of an Estuary* publication (or any handouts that discuss wetland values and functions)

BTNEP Connection
Habitat

Grade Level
7

Duration
60 minutes

Subject Area
science, language arts

Setting
classroom

Vocabulary
metaphor, wetland function

Original Sources
Adapted from "Wetland Metaphors" in *Aquatic Project Wild* (1992) and BTNEP/LSU AgCenter: *Wetland Functions, Values, and Economic Resources,* Activity 1

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www.btnep.org

Background Information
Why should we care about wetland loss? Wetlands provide important benefits to plants, animals, humans, and the entire environment.

In the Barataria-Terrebonne Estuary there is an abundance of wetlands. In fact, coastal Louisiana has 40% of the coastal wetlands in the United States, excluding Alaska. When something is abundant, we sometimes take it for granted and may not appreciate it as we should. Although we have more wetlands than any other state in the United States, we are also losing our wetlands at a faster rate than anywhere else in our country. We experience 80% of the country's coastal wetland loss. Once the wetlands are lost, they are very difficult to rebuild.

In this activity, students will learn about **metaphors**, which is an object or phrase that represents a concept or idea. The metaphors in this activity are common objects that represent some of the many benefits wetlands provide through the way they function, or work. These "benefits" are what is meant when we say that wetlands have "value". Wetlands function in many ways that provide benefits or value to the humans, plants and animals that live within them.

The following chart lists each object and the metaphoric function that wetlands provide.

Wetland Metaphors

Object	Wetland's Metaphoric Function
SPONGE	Absorbs excess water caused by runoff; retains moisture for a time during droughts even if standing water has dried up (sponge stays wet even after it has absorbed a spill)
PILLOW	A resting place for migratory birds
EGG BEATER	Mixes nutrients and oxygen in the water
BABY'S BOTTLE	Provides a nursery that shelters, protects, and feeds young wildlife
STRAINER	Stains silt and debris from water (keeps water supply clean)
COFFEE FILTER	Filters smaller impurities from water (excess nutrients, toxins)
ANTACID	Neutralizes toxic substances
CEREAL BOX	Provides nutrient-rich foods for wildlife and humans
SOAP	Helps cleanse the environment
WETLAND ANIMAL TOY OR PHOTO	Habitat for diverse wildlife

Advance Preparation

1. Either download an article or obtain sets of any of the numerous publications concerning wetland values and functions from the resources provided below.
2. Collect the common items that will be used as metaphors and place them in a pillowcase. (If you collect multiple sets, each group can analyze all of the objects. If you collect one set, simply hand out one or two objects to each group depending upon the number of groups that you have).

Procedure

1. Have students write a short list of things that they personally consider valuable. Ask volunteers to share an item off their list and why they consider it valuable.
2. Introduce the concept that many "functions" of our local wetlands provide values to us that we sometimes take for granted. Read segments of the Background Information aloud to the students.
3. Provide articles, handouts, or publications for each student (or groups of 2-3).
4. Ask students to take about ten minutes and scan the articles to make a list of as many wetland values and functions as possible.
5. After students have completed their list, ask for volunteers to share their information while you write the list on the board, easel, or overhead transparency.
6. Once you have a good amount of information on the board, point out each item on the list and ask students how it is valuable to them as humans, to wildlife, or to our overall environment.
7. Wetlands also perform important functions in the environment, which we may not think are valuable to us, but help to keep ecological balance. Can you list some of these functions?
8. Tell students that they are now going to increase their list of wetland functions and values by the use of *metaphors*.
9. Does anyone know what a metaphor is? Explain to students that a metaphor is a term connecting one thing or idea with another. You can use metaphors to help explain the meaning of something. A metaphor for a cactus may be a pincushion. A metaphor for an engineer might be a beaver. Ask students to try and think of some other common metaphors.
10. Divide students in groups of 2-3 and pass out objects from you "mystery" metaphor bag.
11. Tell students that you are going to bring an object to each group. Their job is to use their knowledge of wetland functions and values to come up with the function or value that their object represents.
12. Allow enough time for discussion of metaphors before stopping the groups and asking them to share.
13. List each object on the board.
14. As the students share, remember that some of the objects' metaphors are more apparent than others. Work with each group to come up with a correct relationship between the object and a wetland function or value and write the relationship on the board.
15. *Wrap-up.* Ask students to volunteer some of the values and functions of wetlands that they did not know before the activity. Discuss how things will change for humans, wildlife, and the environment if the huge amount of wetland loss continues.

Blackline Master

none

Assessment

- Have students use metaphors to relate the many functions of wetlands to everyday objects.
- Have students identify why wetlands are important.
- Have students select 4 species of animals and describe how wetlands are important to each.
- Have students research topics about the effects of wetland loss on local and national level on various commercial, recreational, and cultural activities including hurricane protection, the seafood industry, and the petroleum industry, as well as many others.

Extensions

Technology

Have students create a power point presentation or a website that uses metaphors to describe wetland functions and values.

Language Arts:

Have students write a letter to the Governor, the State Legislature, Congress, or the President stating reasons for national support of wetland conservation issues. Include support of why some people consider Louisiana's wetland loss a national crisis.

Social Studies:

Use a GIS map comparison of wetland loss over the last 50 years and project loss over the next 50 years. Discuss how this loss will affect the culture and lifestyle of the people in those areas.

The Arts:

Have students create a poster or a collage representing a major wetland function or value.

Resources

BTNEP Resources:

Portrait of an Estuary, publication by LSU AG and BTNEP

Tradebooks:

Stille, Darlene R. 2000. **Wetlands (True Books-Ecosystems).** Children's Press.

Examines the different types of wetlands and the plant and animal life they support. Reading level: Ages 9-12.

Lawlor, Elizabeth P. and Pat Archer. 2000. **Discover Nature in Water & Wetlands: Things to Know and Things to Do (Discover Nature Series).** Stackpole Books.

Wetlands provide perfect arenas for nature study. Discover Nature in Water and Wetlands explores the properties, processes, and phases of water and the plant and animal life associated with it, from trees, cattails, and ferns to dragonflies, salamanders, turtles, and beavers. With just a few essentials, such as a field notebook, hand lens, and bug box, readers will find both straightforward information and all kinds of activities to uncover the fascinating, diverse ecosystem that surrounds our ponds, swamps, and other watery place. Reading level: Young adult.

Websites:

United States Geological Survey National Wetlands Research Center - LA Coast website, ***Louisiana Coastal Wetland Functions and Values***, accessed July 27, 2004, at http://www.lacoast.gov/reports/rtc/1997/4.htm

Bill Sipple, US Environmental Protection Agency**,** Office of Water - Watershed Academy Website, ***Wetland Functions and Values***, accessed July 27, 2004, at http://www.epa.gov/watertrain/wetlands/text.html

Ramsar Convention on Wetlands, ***Background Papers on Wetland Function and Values***. Accessed July 27, 2004, at http://www.ramsar.org/values_sediment_e.htm

Louisiana Department of Natural Resources, ***Louisiana Coastal Facts***, accessed July 26, 2004, at http://www.savelawetlands.org/site/webfactsheet.pdf

CDs

Louisiana Wetland Functions and Values CD developed by LSU AgCenter's Extension Service in conjunction with the U.S. Geological Survey's National Wetlands Center and the Louisiana Department of Natural Resources (DNR). To receive a copy, contact DNR (800/ 267-4019) or order on the Internet at http://www.lacoast.gov.

References:

United States Geological Survey National Wetlands Research Center, ***LA Coast website***, accessed July 27, 2004, at http://www.lacoast.gov

Kesselheim, A.S., Slattery, B. E., Higgins, S., Schilling, M. R. 1995. ***WOW! The Wonders of Wetlands: An Educator's Guide***, Environmental Concern Publisher.

Habitat

Activity 1-7

Estuary Ecosystems

Adapted from *Wild Louisiana*

Focus/Overview

Students use research and map skills to gain a better understanding of what an estuary is by comparing the BTES with other estuaries around the United States. *NOTE: Many classrooms have only 1 computer with Internet access. This lesson consists of two activities and is organized with the intent that groups of 3 or 4 students can use the computer while the rest of the class continues working on the other activity. After each group finds the watershed they are researching, they may print it out and return to their seats to copy the information.*

BTNEP Connection
Habitat

Grade Level
7, 8

Duration
90 minutes

Subject Area
science

Setting
classroom

Vocabulary
estuary, watershed, ecosystem, habitat

Original Source
Adapted from *Wild Louisiana.*

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Learning Objectives

The learner will…

- describe the characteristics of an estuary ecosystem.
- identify ways in which human activities have altered estuary ecosystems.
- identify estuarine bodies of water from a U.S. map.
- use maps to identify the location and physical characteristics of the BTES.

Louisiana Grade Level Expectations (Science)

7: GLE-26	Describe and compare the levels of organization of living things within an ecosystem (LS-M-C3).
7: GLE-39	Analyze the consequences of human activities on ecosystems (SE-M-A4).
8: GLE-20	Describe how humans' actions and natural processes have modified coastal regions in Louisiana and other locations (ESS-M-A8).

Louisiana Grade Level Expectation: Social Studies

6, 7, 8: G-1A-M1	Identifying and describing the characteristics, functions, and applications of various types of maps and other geographic representations, tools, and technologies (G-1A-M1).

Materials List

- U.S Map handout or wall map
- BTNEP Thematic Mapper poster
- *Portrait of an Estuary* Publication – classroom set or enough for groups to share
- Computer with internet access
- Class sets of crayons
- Copies of Blackline Masters 1 and 2

Background

An **estuary** is a place where freshwater and saltwater mix. Bodies of water that may be estuaries are: sloughs, bays, harbors, sounds, inlets and bayous. An alphabetical list of the 28 estuaries of nationally recognized significance registered with the National Estuary Program is listed at the website included in the student resources below.

The land area that drains excess water caused by heavy rains or snow melt into channels is called a **watershed**. Gravity and geographical features cause the run-off water to make its way to the ocean through streams and rivers where it will combine with saltwater creating an estuary. The BTES watershed covers 15,769 square kilometers and drains 40% of the contiguous United States. The BTES serves as a drainage basin to 28 states and a small part of Canada. When seen on a map it resembles a huge tree with Louisiana's BTES as the main root.

An **ecosystem** is a specific area where living and non-living things are continuously interacting. A **habitat** is part of an ecosystem, but is specific to one population of animals. For example, the BTES ecosystem includes perfect habitats for alligators.

Advance Preparation

Activity 1

1. Obtain a classroom set of the *Portrait of an Estuary* publication from BTNEP.
2. Copy a classroom set of U.S. Maps or provide a wall map.
3. Obtain the BTNEP Thematic Mapper Satellite poster from BTNEP.

Activity 2

1. You may want to go through the list of estuary links and choose the ones that have a complete chart filled out. Some of the estuary sites have much more information than others.
2. Either assign groups a specific estuary to research or post a list of the estuaries and have students scratch a line through each as they are selected.
3. Have the EPA website listed below already pulled up for the students.
4. Many classrooms have only 1 computer with internet access. These activities are written with the intent that groups of 3 or 4 students can use the computer while the rest of the class continues working on the other activity. After each group finds the watershed they are researching, they may print it out and return to their seats to copy the information.
5. You may want to go through the list of estuary links and choose the ones that have a complete chart filled out. Some of the estuary sites have much more information than others.
6. Either assign groups a specific estuary to research or post a list of the estuaries and have students scratch a line through each as they are used.
7. Have the EPA website listed below already pulled up for the students.

Procedure

1. Introduce both activities before allowing the students to get started so that groups may rotate to use the computers.
2. Use a wall map to point out some lakes and some estuaries. Ask them to identify what differences they can see on the map between the two. (Estuaries occur along the coastline and open to the ocean. Lakes are totally enclosed as their own body of water.) Continue allowing the students to point out other possible estuaries.

1. Introduce both activities before allowing the students to get started so that groups may rotate to use the computers.
2. Use a wall map to point out some lakes and some estuaries. Ask them to identify what differences they can see on the map between the two. (Estuaries occur along the coastline and open to the ocean. Lakes are totally enclosed as their own body of water.) Continue allowing the students to point out other possible estuaries.

Activity 1

1. Divide the class into groups of 3 or 4, making sure that each group has a U.S. Map handout and at least one *Portrait of an Estuary* booklet.
2. Provide each student with a **BTES Data Sheet (Blackline Master #1)** and a **National Estuary Ecosystem Research Sheet (Blackline Master #2)**.
3. Restate the definition of an estuary as a place where salt water and fresh water mix.
4. Use the U.S. map to highlight the portion of Louisiana makes-up the BTES.
5. Use the U.S. map to describe that nearly all of the run-off water from the central U.S. makes its way to the Mississippi River and flows down to the Gulf of Mexico.

6. Ask students to refer to their U.S. maps and infer why the water flows all the way down to the Gulf of Mexico instead of either staying in place or flowing out to the Atlantic or Pacific. (The Earth's gravity forces the water to flow towards the ocean. Geographical features such as mountains funnel the water down to the Gulf of Mexico.
7. Review the **BTES Data Sheet (Blackline Master #1)** to make sure that students understand all the terminology.
8. Introduce the *Portrait of an Estuary* booklet to the students.
9. Have students complete their **BTES Data Sheets (Blackline Master #1)** using the *Portrait of an Estuary* as a reference.
10. While everyone is on task, allow small groups of students to analyze the BTNEP satellite image wall map. Have students use natural and man-made features (highways) to locate their neighborhoods or towns.
11. All students should be on task with these activities while waiting for their turn at the computer where they will find the information to complete their second activity.

Assessment, Activity 1:

- Correct the completed BTES data sheet
- Use land features on the U.S. map to identify and explain the watershed of the BTES.
- Explain why the BTES is considered an estuary
- Use physical features on a state map to identify the area that the BTES is located in Louisiana.

Activity 2

1. As students are working on their **BTES Data Sheet**, allow groups to rotate use of the computer to research information for Activity 2.
2. Explain to students that the EPA has 28 estuaries participating in the National Estuary Program. These are listed in alphabetical order on the website provided below with links to each.
3. Have students explore the list and choose one to fill out their **National Estuary Ecosystem Research Sheet (Blackline Master #2)**.
4. Some of the links offer more information than others. Encourage students to fill out as much information as possible. If time constraints on computer use are a factor, have students print out the one page of information on their estuary when it is located. They may take this information back to their desk to complete the data sheet.
5. Have students compare the information that they have found about other estuaries with the information they recorded about the BTES by answering the questions on their data sheet.

Assessment, Activity 2:

- Have each group share what they have discovered from this activity with the rest of the class, using a U.S. map to reference the location of their estuary.
- Collect the completed Estuary Research Data sheets

Blackline Masters

1. **Estuary Ecosystem Data Sheet – Barataria-Terrebonne National Estuary**
2. **Estuary Ecosystem Data Sheet**

Extensions

- **Language Arts:**
  Have students write letters to students in schools located near other estuaries. They may ask questions about programs they have locally to try and help their estuaries.

- **Social Studies:**
  Use road map that includes the BTES area. Have students analyze the map to see how people have chosen the land on which communities are built. Explain the significance of community names such as "Willowdale Ridge".

- **Math:**
  All of the watershed areas in this activity are expressed in square kilometer units. Have students convert kilometers to miles so they can have a clear understanding of the measurements involved and also be able to compare mileage to kilometers.

- **The Arts:**
  Have students trace a map showing the full Mississippi watershed. When they have traced the watershed, it appears like long roots of a tree. Have students use this tracing to create other art or posters explaining the term *watershed*.

Resources

BTNEP Resources:

Portrait of an Estuary, published by Louisiana State University AgCenter and BTNEP, request from BTNEP or print the file from http://www.agctr.lsu.edu/Communications/pdfs_bak/pub2802estuary.pdf

Thematic mapper/poster (satellite image of BTES), request from BTNEP

Tradebooks:

Johnson, Rebecca L. 2004. **Journey into an Estuary**. Lerner Publishing Group. 48pp ISBN: 1575055929

Takes readers on a walk at a sheltered bay, showing examples of how the animals and plants of estuaries are connected and dependent on each other and the estuary's mix of fresh and salt water. Age range: 8-12.

Walker, Sally M. 2003. **Life in an Estuary**. Lerner Publishing Group. 72 pp.

Examines the physical features, processes, and many different species of plants and animals that make up the ecosystem of the largest estuary in the United States, the Chesapeake Bay.

Websites:

National Ocean Service, National Oceanic and Atmospheric Administration. 3 July 2003. ***Estuaries: Where Rivers Meet The Sea***. Accessed July 22, 2005 at http://estuaries.gov/about.html.

General information website about estuaries. Gateway to EstuaryLIVE. Good information.

U.S. Environmental Protection Agency. 2003. ***Which Estuaries are in the NEP?*** Accessed July 22, 2005 at http://www.epa.gov/owow/estuaries/find.htm.

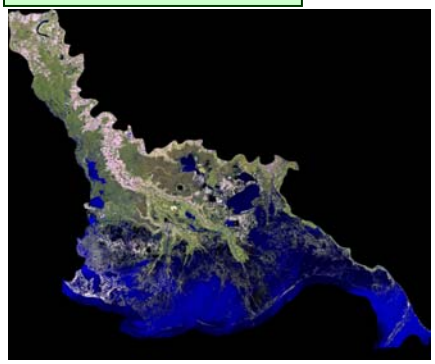
EPA National Estuary Program map and links to individual estuary programs.

U.S. Environmental Protection Agency. 2003. ***EPA National Estuary Program Map***. Accessed July 22, 2005, at http://www.epa.gov/owow/estuaries/find.htm

U.S. Environmental Protection Agency. 2003. ***EPA National Estuary Program.*** Accessed July 22, 2005, at http://www.epa.gov/owow/estuaries/list.htm.

Links to all 28 participating estuary programs.

Blackline Master #1



Satellite view of the Barataria-Terrebonne National Estuary.

ESTUARY ECOSYSTEM DATA SHEET

Barataria-Terrebonne National Estuary

Parentheses refer to information in particular sections of *Portrait of an Estuary* .

State in which the estuary is located: Louisiana

Area of watershed: 15,769 square kilometers

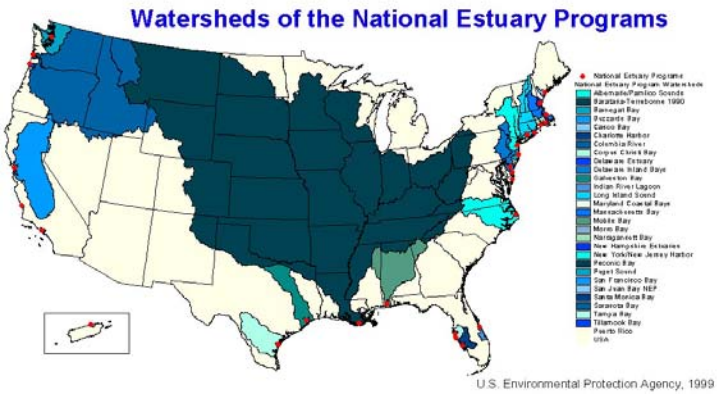
Priority management issues (Section: *Causes of Loss*):

Major habitat types within the estuary (Section: *The Barataria-Terrebonne Estuary System Description*):

Federally endangered or threatened species (Section: *Fish and Wildlife Habitat*):

List three things about the Barataria-Terrebonne Estuary System that you find interesting:

Blackline Master #2



ESTUARY ECOSYSTEM DATA SHEET

Name of the Estuary Program:

State in which the estuary is located: _____

Area of watershed: _____ square kilometers

Priority management issues:

Major habitat types within the estuary:

Federally endangered or threatened species:

List three things about this estuary system that you find interesting:

Habitat

Activity 1-8

Wetland ECO-Bingo

Adapted from Florida's *4-H Earth Connections Curriculum* and
BTNEP/LSU AgCenter: *Wetland Functions, Values and Economic Resources*

Focus/Overview

This activity can be used to introduce the concepts of habitat and ecosystem. It can also be used to review the concepts learned about wetlands.

Learning Objectives

The learner will…

- define the terms "ecosystem" and "habitat."
- identify the many habitats of the Barataria-Terrebonne estuarine ecosystem.
- identify the components of a habitat and an ecosystem.

Louisiana Grade Level Expectation (Science)

5: GLE-26	Identify and describe ecosystems of local importance (LS-M-C3).

Materials List

- Wetland ECO-Bingo cards
- Beans, shells, corn or other markers
- Wetland ECO-Bingo game words
- Container for game words
- Shoe box

Background Information

The Barataria-Terrebonne Estuary may be thought of as the wetland ecosystem within which there are many distinct but overlapping habitats that support a specialized group of plants and animals. The habitats include: Bottomland Hardwood, Swamp, Natural and Artificial Levees, Freshwater Marsh, Intermediate Marsh, Brackish Marsh, Salt Marsh, Barrier Island, Beach, Bay, Lake, Bayou, and the Gulf of Mexico. If the students are able to take a field trip to at least one of these habitats, they will become familiar with some of the species. A description of the major habitat types can be found on the handout**, Wildlife Habitats of the Barataria-Terrebonne Estuary**. The Wetland Wildlife Checklist helps to define some of these habitats. In addition, more information about these habitats can be found in ***Saving Our Good Earth: A Call to Action, Barataria-Terrebonne National Estuary Program Characterization Report***. Contact BTNEP for a copy.

Advance Preparation

1. Make ECO-Bingo cards, one per student. Laminate if possible.
2. Cut out the ECO-Bingo Games words.

Procedure

1. The Barataria-Terrebonne Estuary represents an ecosystem. Similar climate and conditions exist within the estuary. The definition of an ecosystem is an area where similar conditions, plants and animals exist. The definition of a habitat is similar, but a habitat is more specialized. Depending on the students' experiences, discuss the various habitats of the estuary, letting students give examples of plants and animals seen in the different habitats.

BTNEP Connection
Habitat

Grade Level
5

Duration
45 minutes

Subject Area
science

Setting
classroom

Extension Areas
art, language arts

Vocabulary
ecosystem, habitat

Original Sources
Adapted from Florida 4-H Earth Connections Curriculum and "Wetland ECO-Bingo!" in BTNEP/ LSU AgCenter: *Wetland Functions, Values and Economic Resources,* Activity 3.

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

2. Within the Barataria-Terrebonne Estuary Ecosystem are many different habitats. The organisms found in each habitat are adapted to the conditions there. Habitats often overlap and animals may move from one habitat to another but finding certain plants and animals living together tells us what kind of habitat it is.
3. Divide the class into groups of two and give each group an ECO-Bingo card (or you can make enough bingo cards for each individual student) and some beans (or other markers). Have one student be the "caller" and give him or her the container of ECO-Bingo game words. The caller pulls the game words from the container and calls them out while the students place markers on the squares as the habitats are called. When a group fills their card completely, they call BINGO! Each time BINGO! Is called, each member of the group names a plant or animals that lives in one of the named habitats and gives a function or value (different from the last group) or the named habitat. The group must also tell how the habitat they name fits into the ecosystem of the estuary – what is its special place.

Blackline Masters

1. **Wildlife Habitats of the Barataria-Terrebonne Estuary**
2. **ECO-Bingo Game Words**
3. **ECO-Bingo Game Cards** (multiple copies)

Assessment

- The students will be able to identify a plant or animal from a given habitat
- The students will be able to give a function or value of a named habitat
- The student will explain how a habitat fits in an ecosystem

Extensions

The Arts:

Have students create dioramas of a chosen habitat. The dioramas can be made in a large shoe box. The dioramas can be accompanied by a written description of the habitat, the organisms that live there, and its functions and values within the Barataria-Terrebonne ecosystem.

Have students create drawings of different habitats within the BTE ecosystem.

Resources

BTNEP Resources:

Saving Our Good Earth: A Call to Action, Barataria-Terrebonne National Estuary Program Characterization Report.

Tradebooks:

Lisowski, Marylin, and Robert A. Williams. 1997. **Wetlands**. Scholastic Library Publishing. 28pp. ISBN: 0531113116

Not long ago, wetlands were seen as dank, useless places where mosquitoes breed. Some were drained; others were used as dumping grounds. Today, we know that wetlands areas provide homes to a tremendous variety of wildlife. They provide us with food and water, act as flood barriers and prevent erosion. As readers carry out the projects and activities in this book, they too will come to appreciate the value of wetland ecosystems. Age Range: Young Adult

Stewart, Melissa, and Stephen K. Maka. 2003. **Life in a Wetland**. Lerner Publishing. 72pp. ISBN: 0822546876

Go on a journey through the swampy marshes and cattail-filled fields that are found where water and land combine. Using the Florida Everglades as an example, Life in a Wetland examines the physical features, processes, and many different species of plants and animals that make up a unique wetland ecosystem. Find out about the impact of humans and learn what makes it so special. Age Range: 12 and up.

Stille, Darlene R. 2000. **Wetlands (True Books-Ecosystems).** Children's Press.

Examines the different types of wetlands and the plant and animal life they support. Reading level: Ages 9-12.

CDs

Louisiana Wetland Functions and Values CD developed by LSU AgCenter's Extension Service, U.S. Geological Survey's National Wetlands Center and the LA Department of Natural Resources (DNR). To receive a copy, contact DNR (800/ 267-4019) or order on the Internet at http://www.lacoast.gov.

Blackline Master #1

Wildlife Habitat in Barataria-Terrebonne Estuary

From a purely biological viewpoint, wetlands are production machines, out-producing most other ecosystems several times over. Plant material (termed primary productivity) is produced in huge quantities, and it supports a complex food web made up of all kinds of consumers: worms, insects, spiders, fish, reptiles and amphibians, crustaceans, birds, and mammals. Detritus, or dead and dying plant and animal material, actually makes up the food source for most of the primary consumers in the food web. This productivity results in a huge variety of animal life.

Migrating ducks and geese depend on wetlands for resting and feeding during their long annual treks. Loss of wetlands means loss of waterfowl populations. The coastal wetlands of Louisiana are also a crucial stopover point for neotropical (from tropical South America) birds as they make their migrations in the spring and fall. They stop to feed and rest along coastal cheniers and ridges, giving birders an opportunity to see unusual and colorful species.

A number of endangered and threatened species also depend on wetlands for their survival and thrive in Barataria-Terrebonne. Nationwide, 79 wetland plant and animal species are listed as threatened or endangered. The Bald Eagle and the Brown Pelican are the best known of the recovering species that reside in Barataria-Terrebonne, but there are others, including several species of sea turtles and fish.

The marshes provide nutrition and shelter for numerous marine species that complete part of their life cycle in the coastal wetlands and the remainder in the open water of the Gulf of Mexico. Some species are economically, as well as biologically, important.

All of this adds up to an incredible diversity of plant and animal species supported by our coastal wetlands and represents high levels of biodiversity. One way to explain the importance of biodiversity is to imagine the ecosystem as a city bustling with "people" all taking care of the multitudes of jobs that need to be done each day. Plants are converting sunlight to energy; insects are converting plant matter to energy; decomposers, detritivores, and scavengers are tearing down dead, decaying material to make nutrients available for new plants and animals. Biodiversity means there are enough kinds of organisms to do all of the jobs in the ecosystem (the city). If biodiversity is diminished, some jobs go undone and the ecosystem is altered. It might be compared to when an essential group of workers goes on strike and life becomes difficult for everyone. Biodiversity is also important to humans because of the contributions to medicine and genetics-related research.

The Major Habitats of the Barataria-Terrebonne Estuary

Bottomland hardwood and natural ridge habitats represent the higher wet habitats of the estuary. The land is higher and the soils are better drained. Trees such as hackberry, palmetto and live oak thrive. Animals that prefer dry ground occupy these habitats. They include rabbits, deer, armadillos, squirrels, raccoons, box turtles, and king snakes. Humans have also occupied these habitats more than any of the others, converting the forest to farmland and urban areas. Much of the bottomland hardwood habitat is in the upper part of the estuary, while the natural levees extend like fingers towards the Gulf of Mexico, following the courses of the natural bayous.

Swamp habitat may be defined as forested wetland, flooded for a large part of the year. The dominant vegetation includes bald cypress, swamp tupelo gum, and red maple, three species adapted to living in flooded conditions. The animals found in the swamp are also adapted to wetter conditions. They include alligators and turtles, herons and egrets, nutria and swamp rabbits. The swamps are also found in the upper part of the estuary.

Freshwater marsh habitat is characterized by its wide variety of herbaceous plant species including bulltongue, giant cut grass, water lilies, and pickerel weed. Many species of birds, frogs, fish, snakes, and other reptiles inhabit the freshwater marshes. The freshwater marshes are found adjacent to the swamp, usually on the Gulf side, south of the forested wetlands.

Intermediate marsh habitat is a transition zone between freshwater and brackish marsh habitats. Though it has the largest number of furbearers, it has fewer species than the freshwater habitat, but more than the brackish habitat.

Brackish marsh habitat is characterized by having far fewer species of herbaceous plants than the freshwater marsh. Plants living in brackish marsh must be able to tolerate changing salinity levels as salt water and fresh water mix. The dominant species of plant is wire grass. Common animal species include otter, mink, ibis, white pelicans, blue crabs and shrimp.

Saltwater marsh habitat is a more specialized habitat, and fewer species are adapted to living in the harsh conditions of the salt marsh. The dominant vegetation is oyster grass, also called smooth cord grass or *Spartina alterniflora*. Other plants include black rush and black mangrove. The salt marsh snail lives on the stems of the oyster grass, and oysters, shrimp, crabs and numerous species of fish abound beneath the water. The saltwater marsh is the nursery ground for many Gulf species. Brown pelicans also are seen feeding with gulls and terns.

At the end of the estuary lie many **bayous and lakes** as the salt marsh gives way to the Gulf of Mexico. Most of the life is found beneath the water, as any fisherman knows. Redfish, shrimp, blue crabs, flounder, and oysters are some of the many species living in these habitats. Almost half of Barataria-Terrebonne is made up of shallow open water, which includes saltwater bays as well as freshwater lakes further inland.

Finally, the **barrier islands** represent the last terrestrial habitat before the open waters of the Gulf. The barrier island habitat is harsh. The species there are adapted to an unstable, salty environment. On the Gulf side, a barrier island is made up of a beach and low sand dunes inhabited by grasses and shrubs, including groundsel and iva. The bay side of the barrier island is dominated by salt marsh habitats. Barrier islands are subject to rapid erosion rates, and frequent storms, but they are very important, specialized habitats for many species, particularly seabirds.

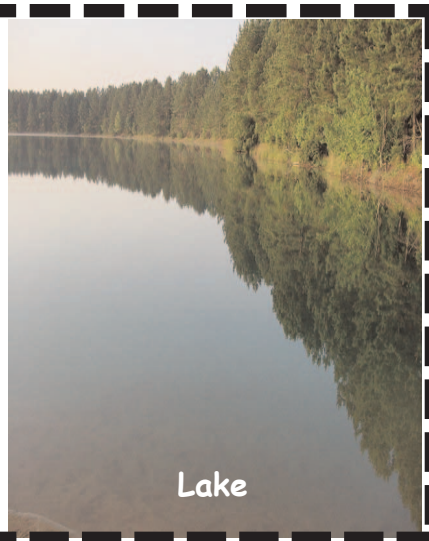
Blackline Master #2

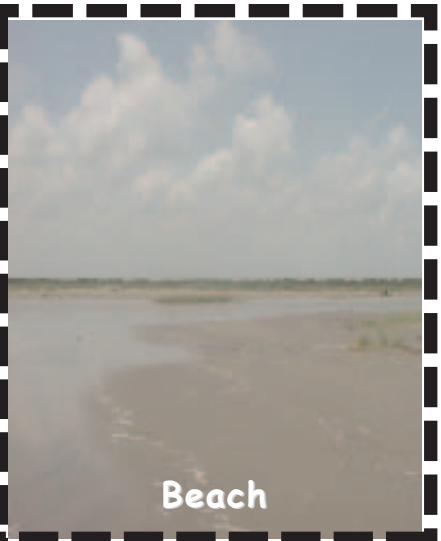
ECO-Bingo Game Words

Cut out the words and place in a container. The "caller" draws the word cards and calls them out to the players.

BOTTOMLAND HARDWOOD FOREST	LAKE	BEACH
BARRIER ISLAND	SWAMP	INTERMEDIATE MARSH
SALT MARSH	AGRICULTURAL FIELD (Sugarcane Field)	ESTUARY
NATURAL LEVEE	GULF	BAY
BAYOU	ARTIFICIAL REEF	FRESHWATER MARSH

ECO-Bingo Card 1





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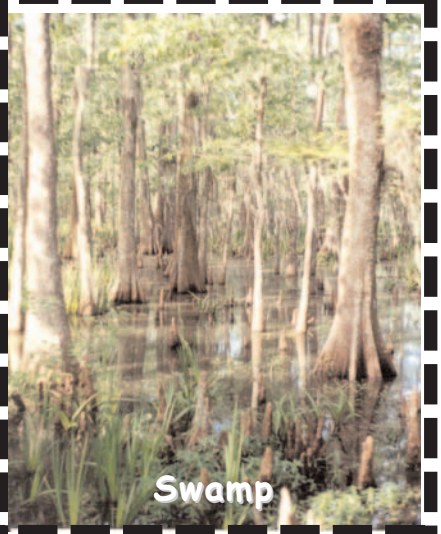
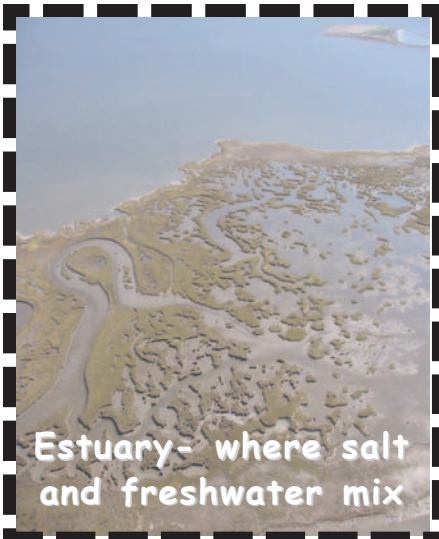
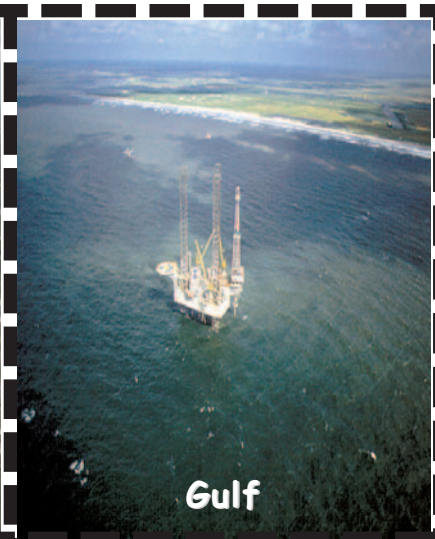
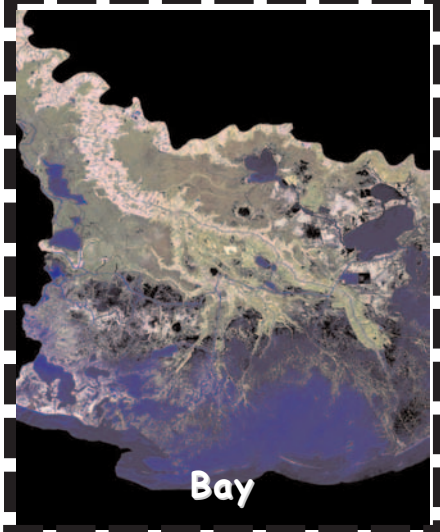


ECO-Bingo Card 2







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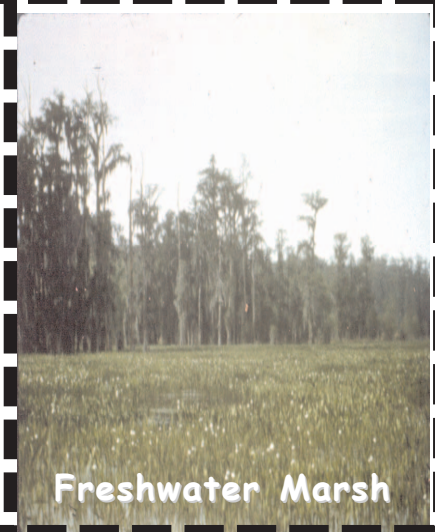
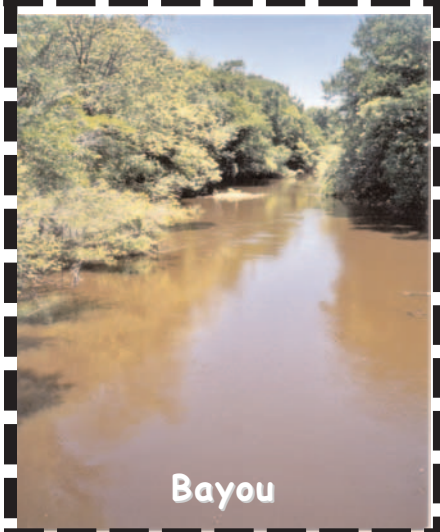
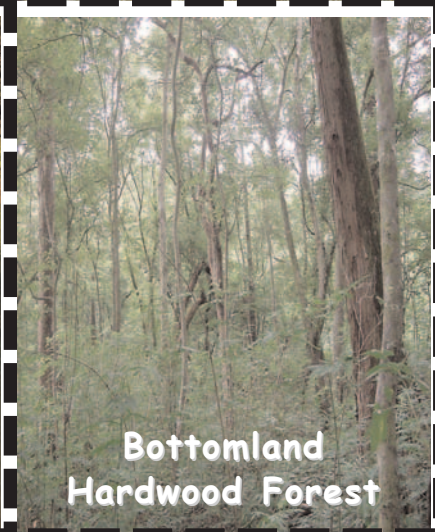
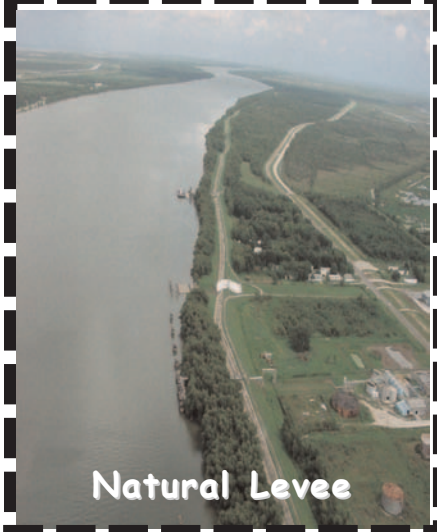






ECO-Bingo Card 3



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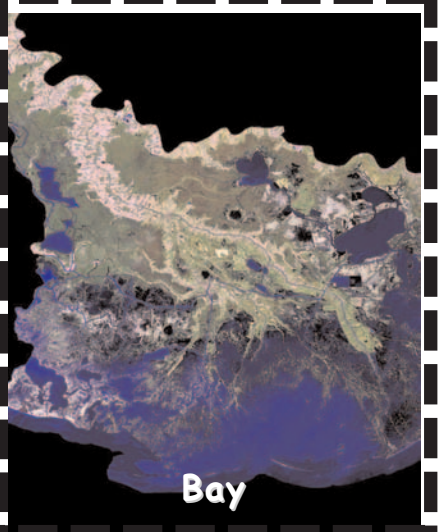
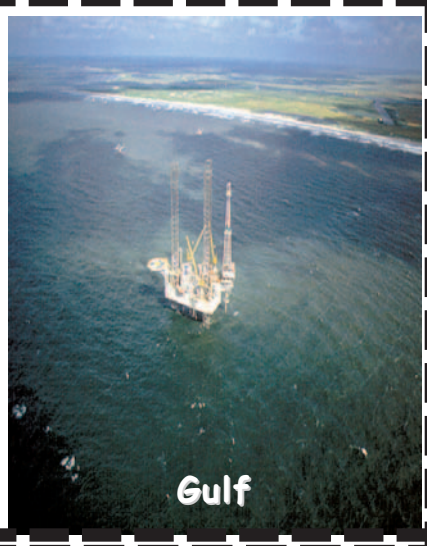
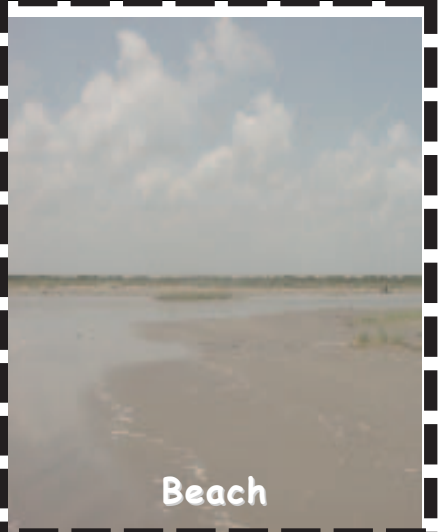
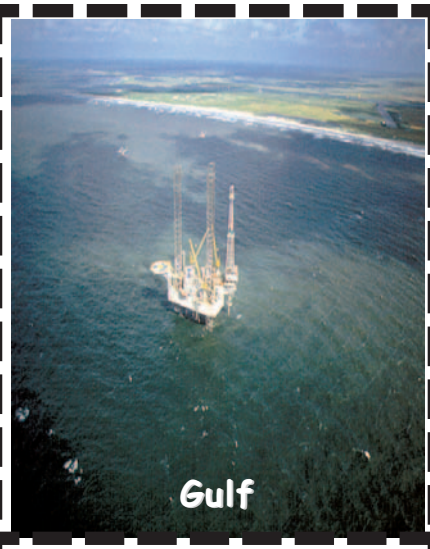
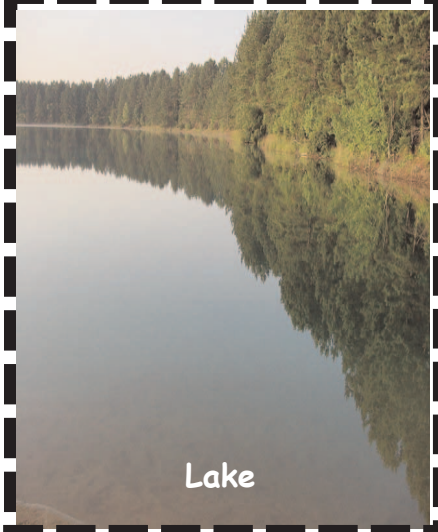






ECO-Bingo Card 4





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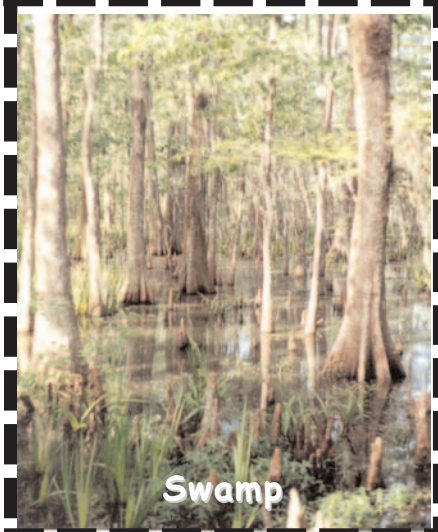
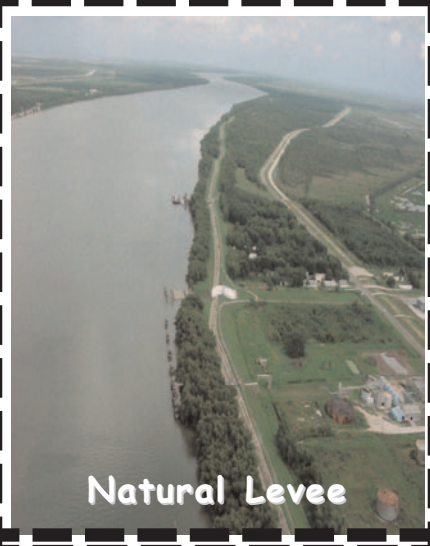
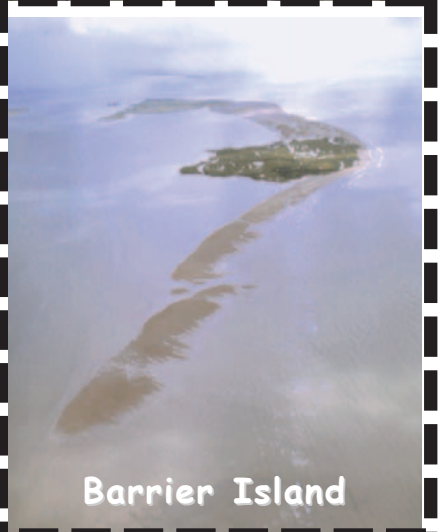
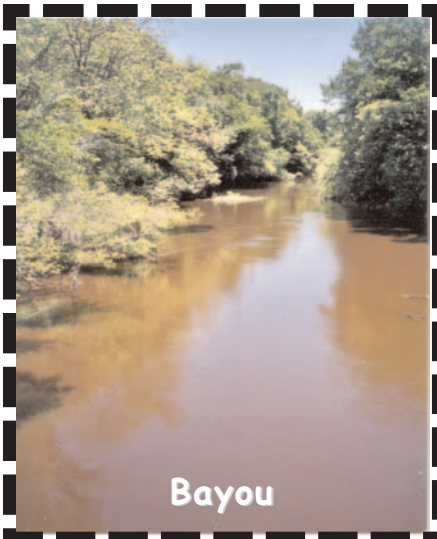
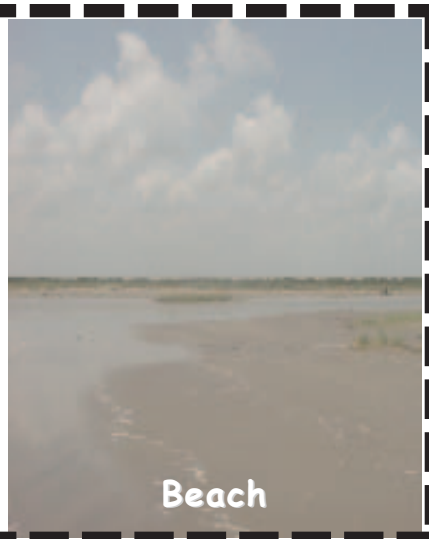
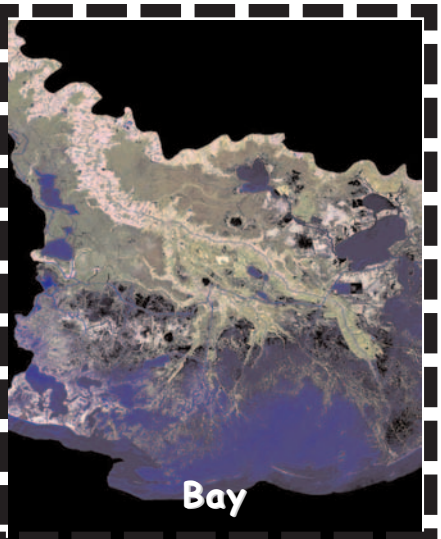
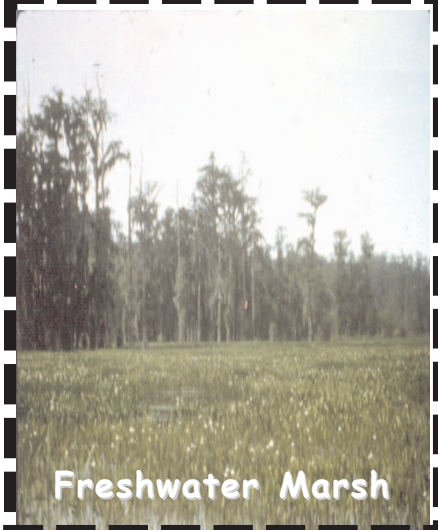
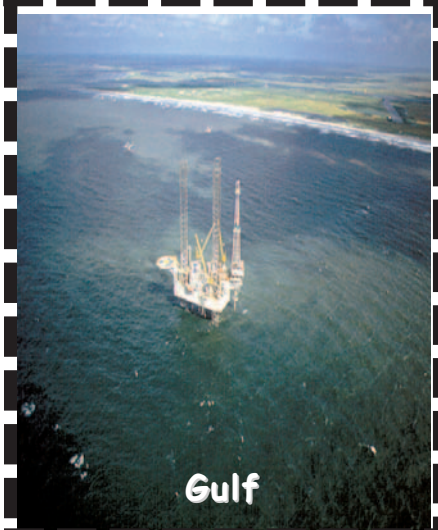
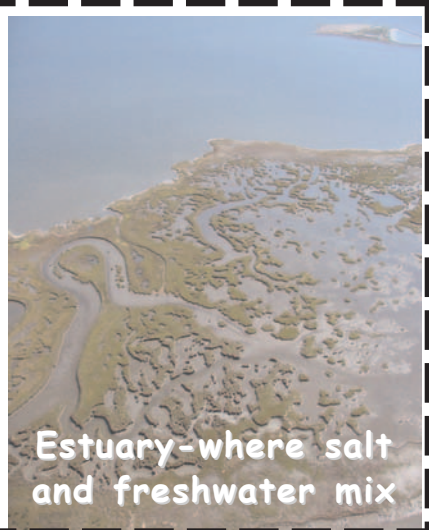


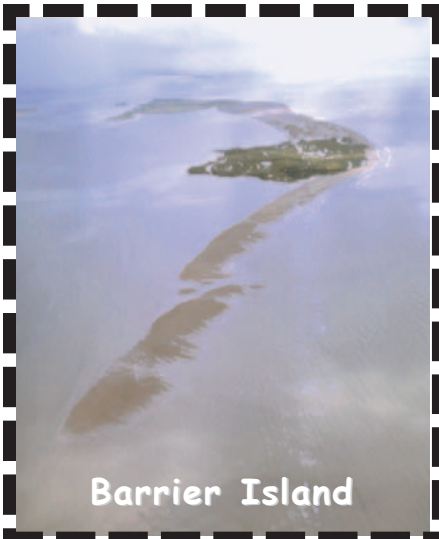




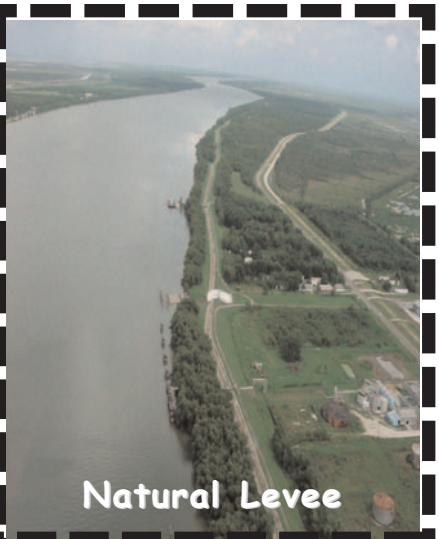
ECO-Bingo Card 5

 Bayou	 Beach	 Bay
 Freshwater Marsh	FREE SPACE	 Sugar Cane Field
 Gulf	 Estuary-where salt and freshwater mix	 Salt Marsh

ECO-Bingo Card 6

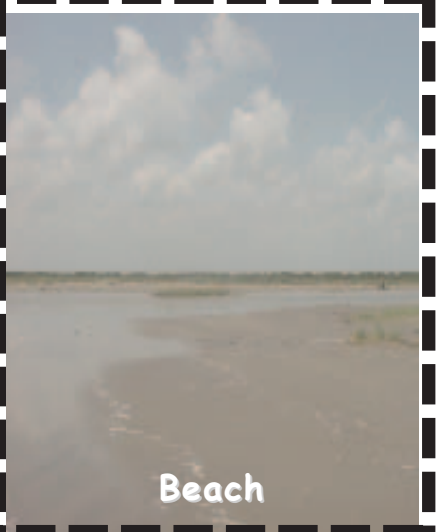

Barrier Island

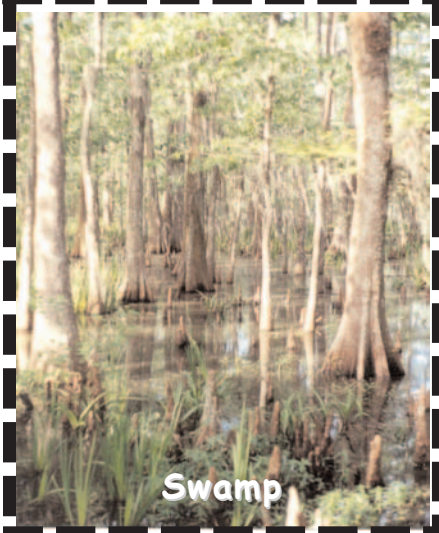

Intermediate Marsh

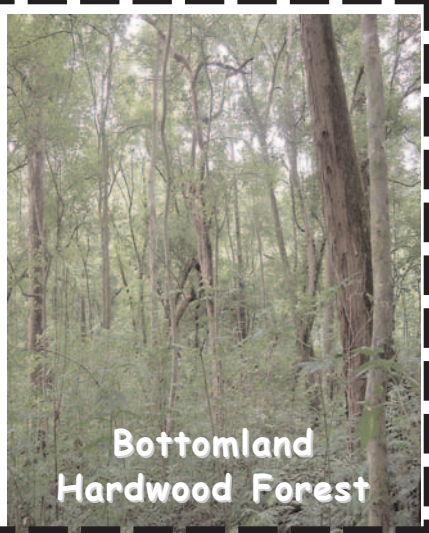

Natural Levee

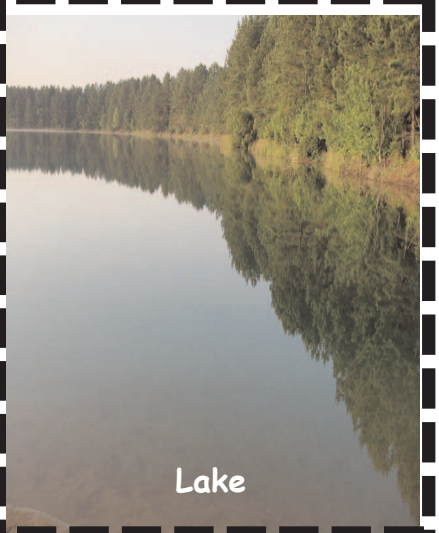

Freshwater Marsh

FREE SPACE

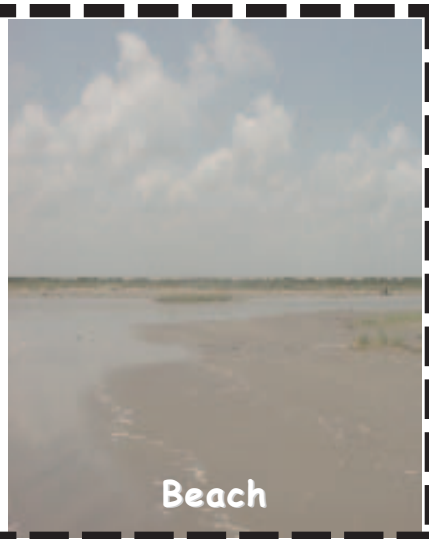

Beach

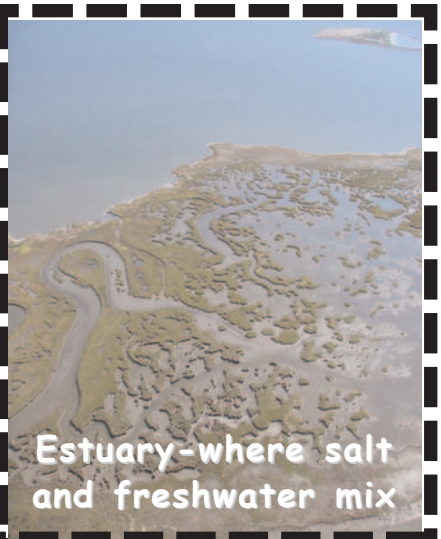

Swamp

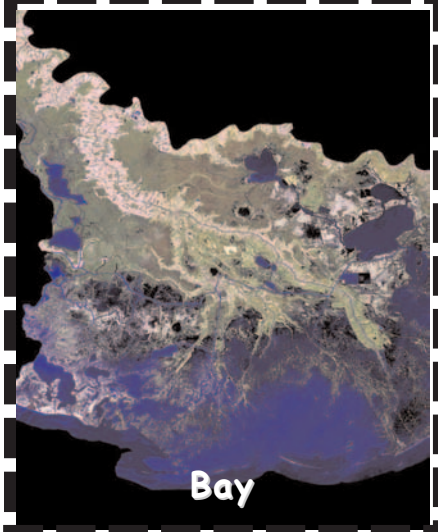

Bottomland Hardwood Forest


Lake

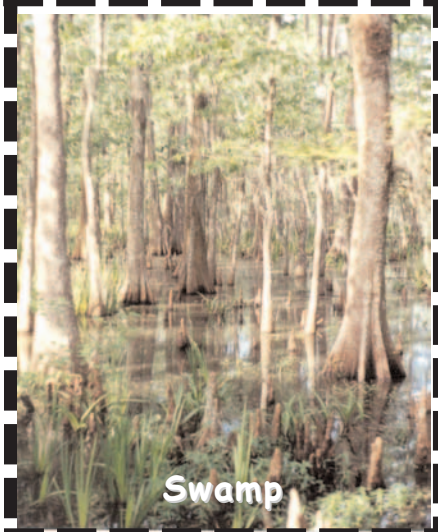
ECO-Bingo Card 7

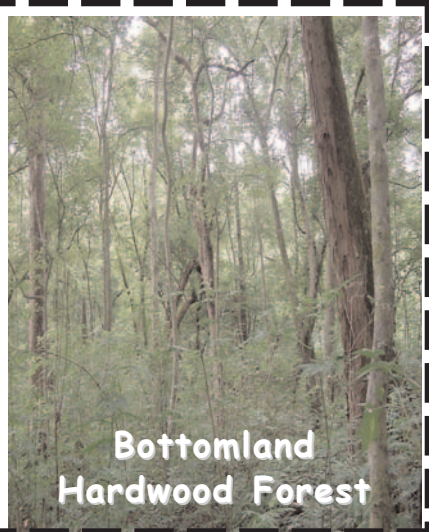


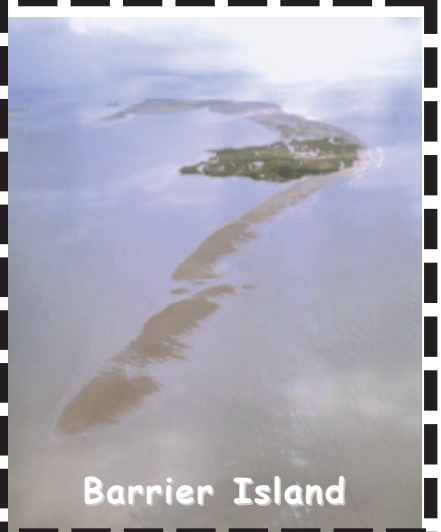




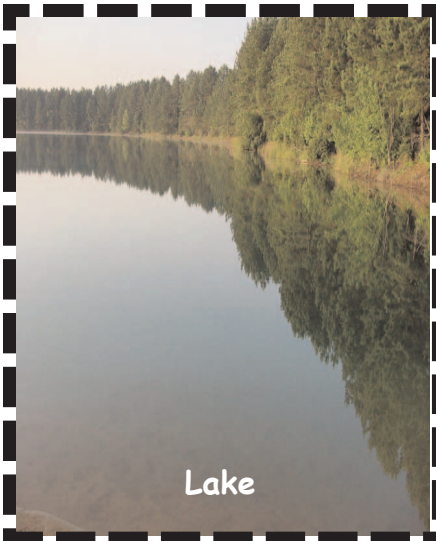
FREE SPACE

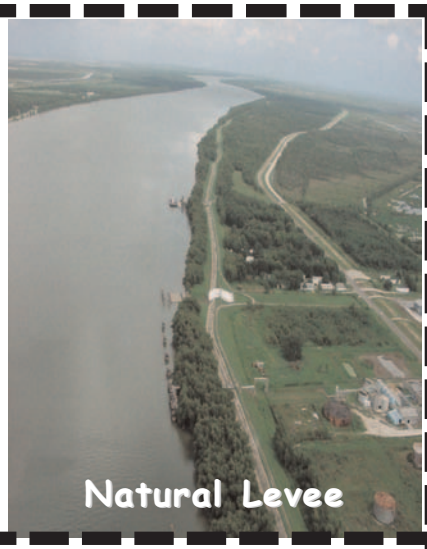


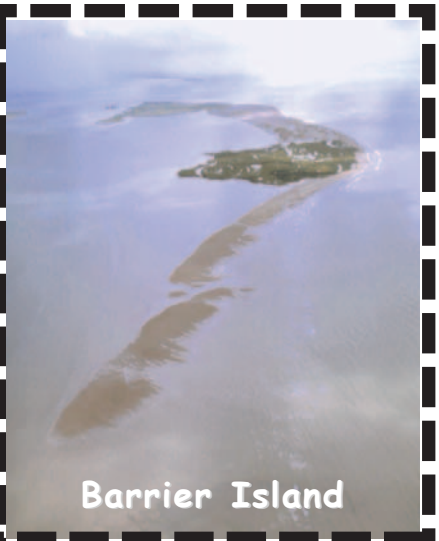




ECO-Bingo Card 8







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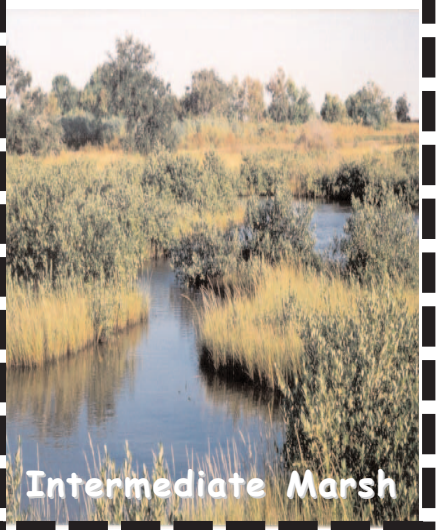
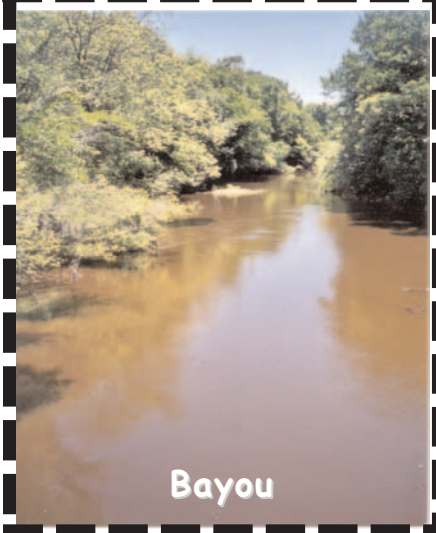
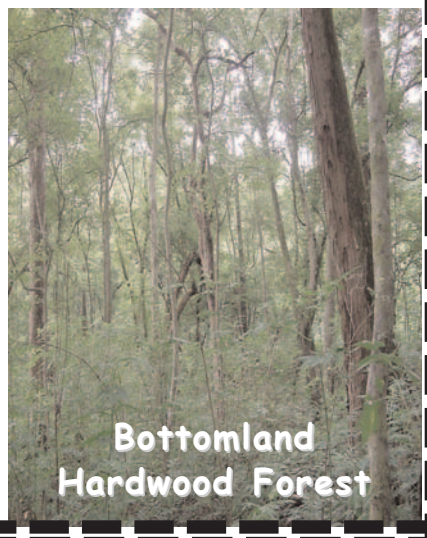
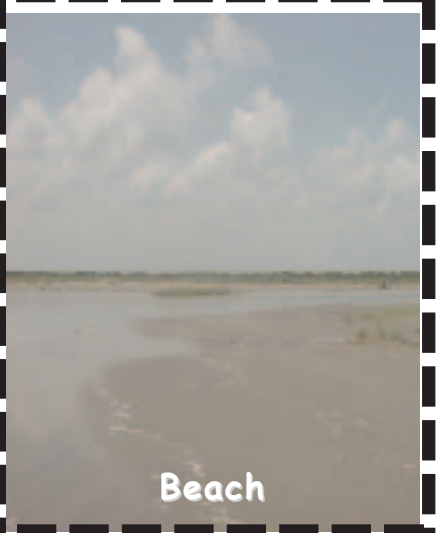
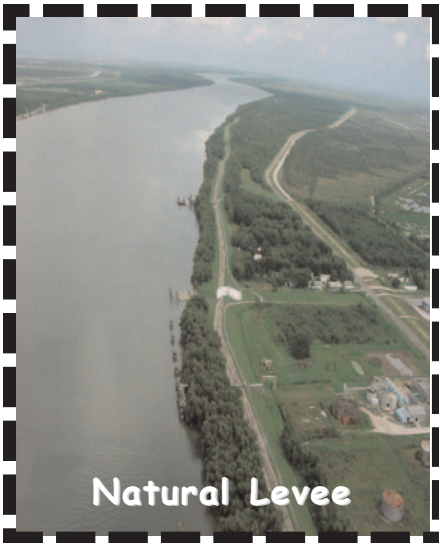


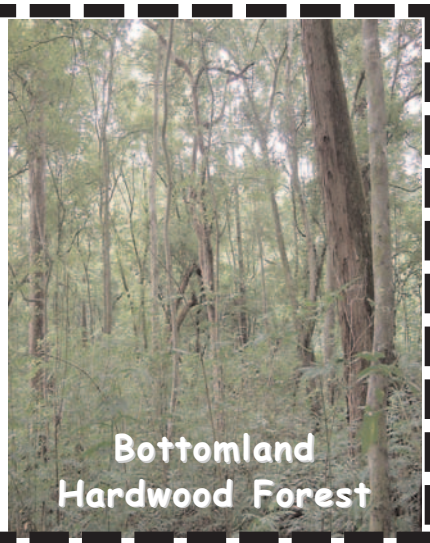


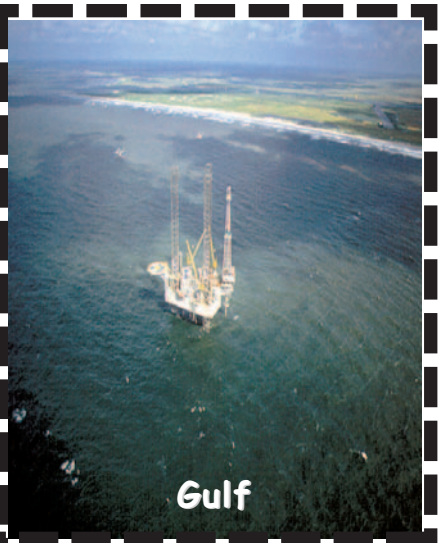




ECO-Bingo Card 9







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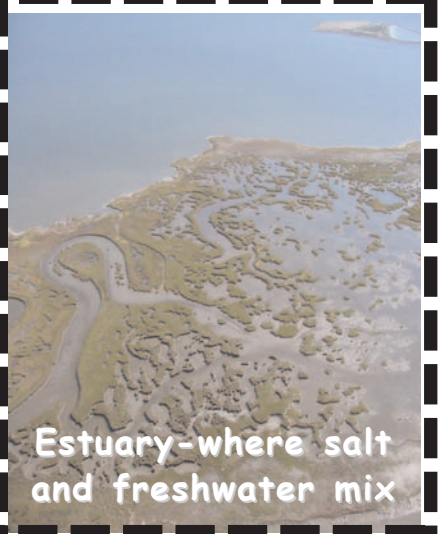
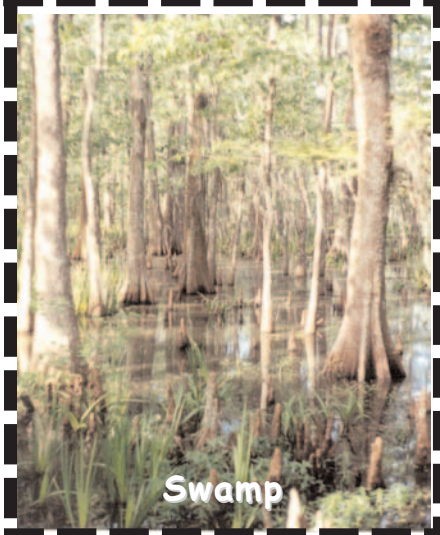
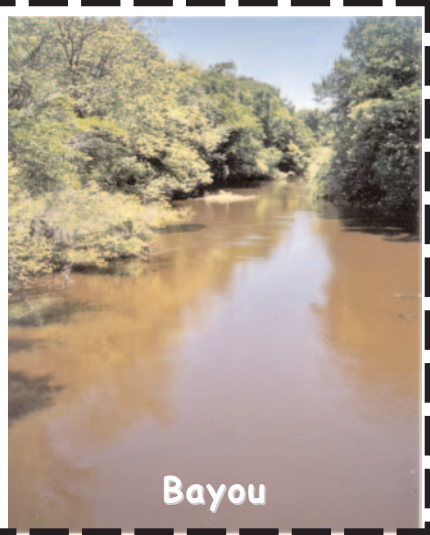
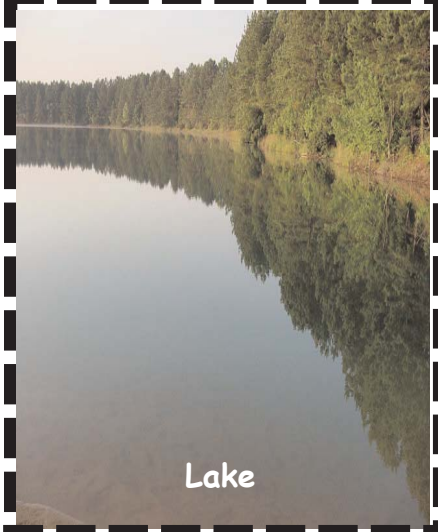
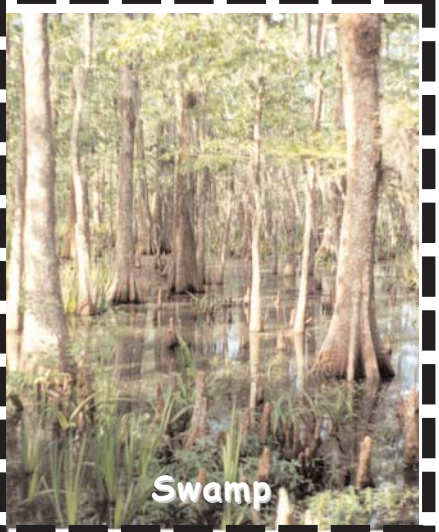
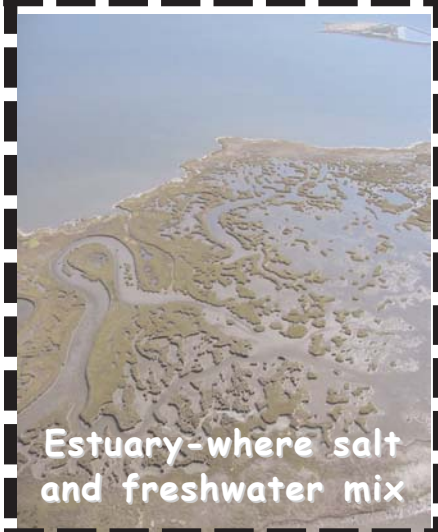
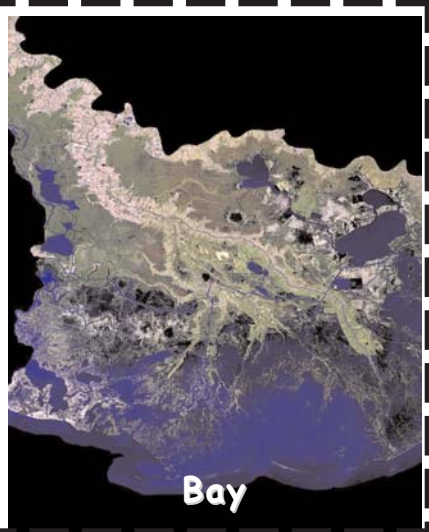
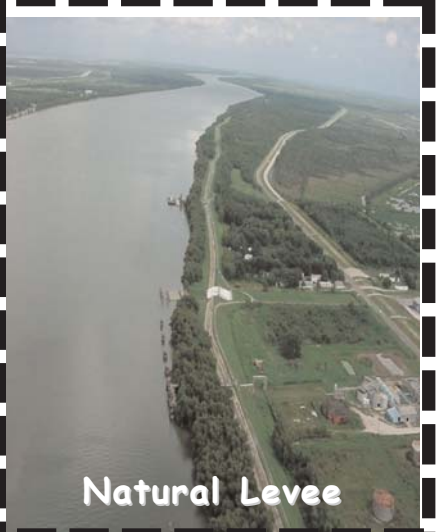


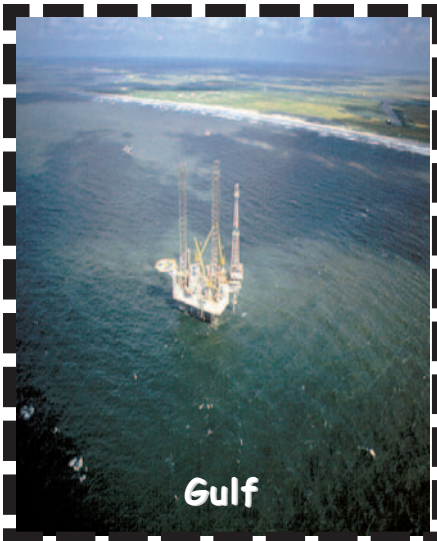




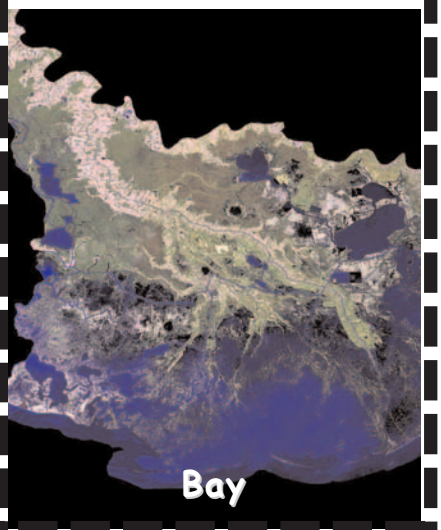
ECO-Bingo Card 10

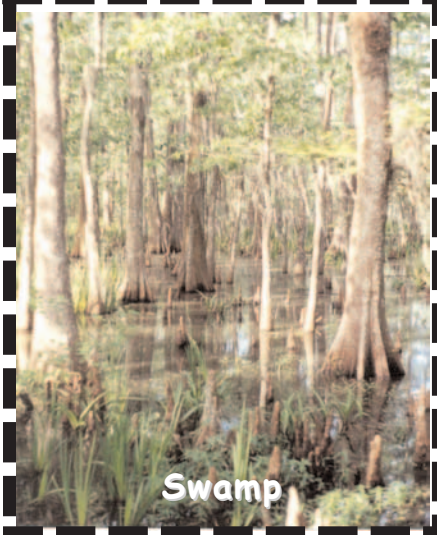
 Beach	 Sugar Cane Field	 Salt Marsh
 Lake	FREE SPACE	 Swamp
 Estuary-where salt and freshwater mix	 Bay	 Natural Levee

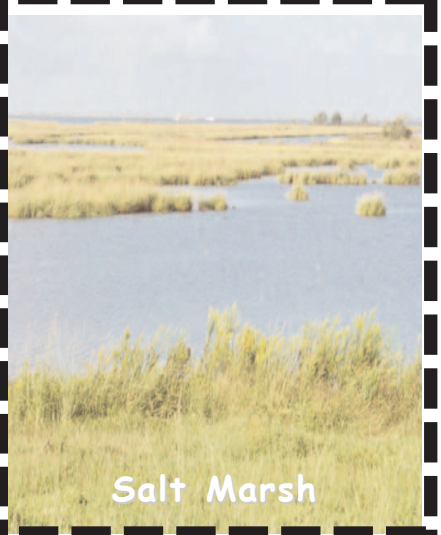
ECO-Bingo Card 11



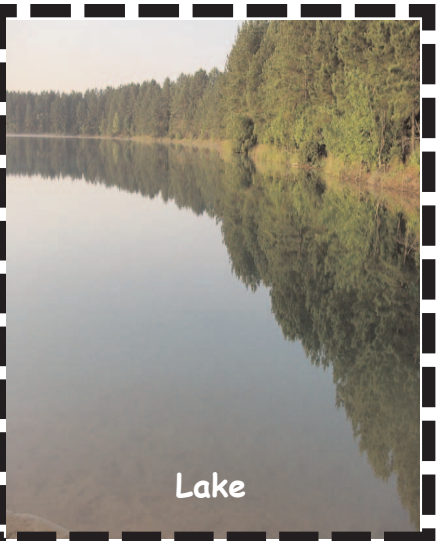
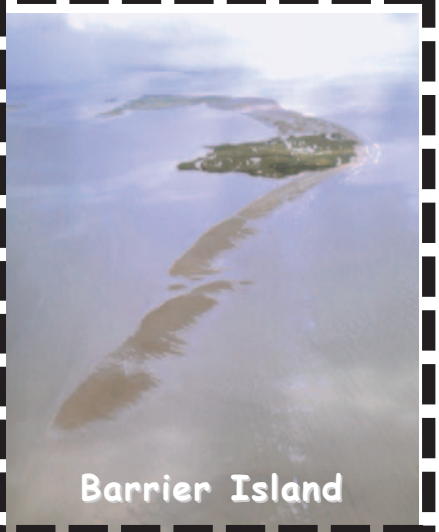
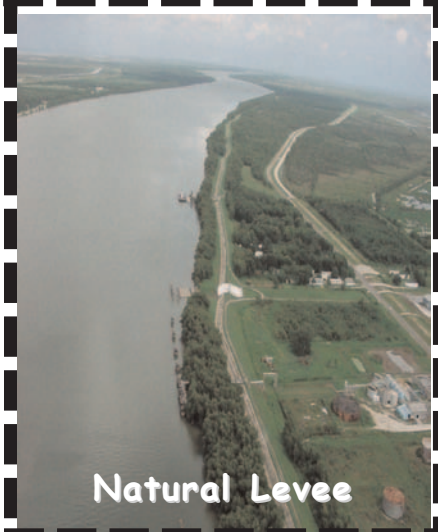
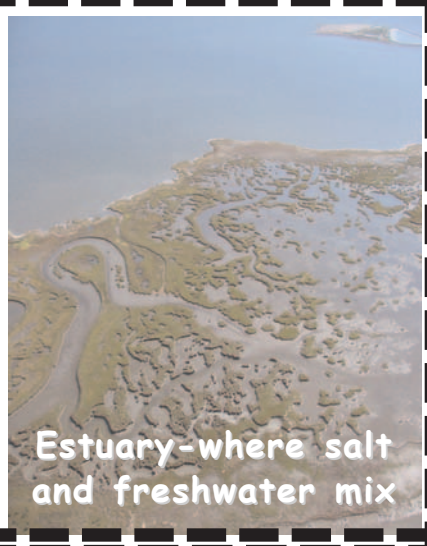
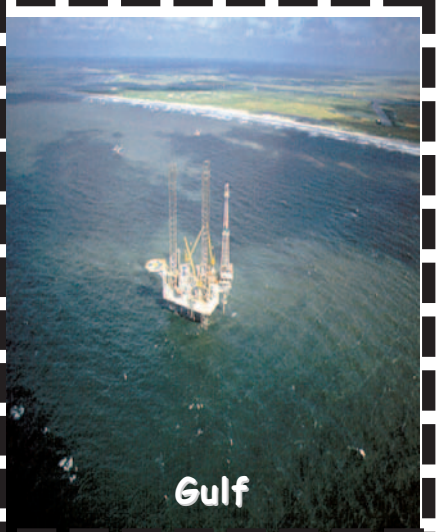
FREE SPACE



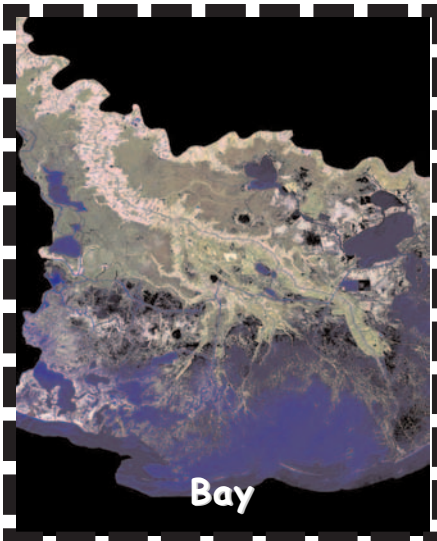
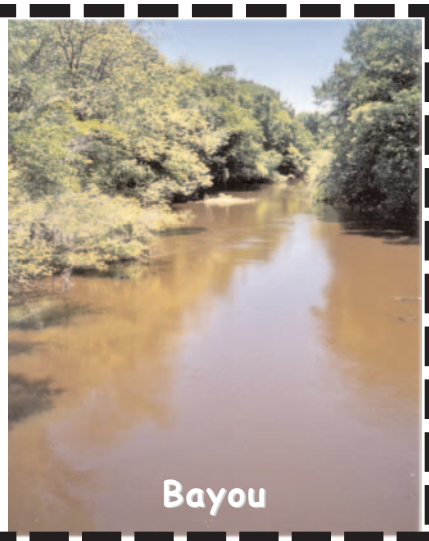
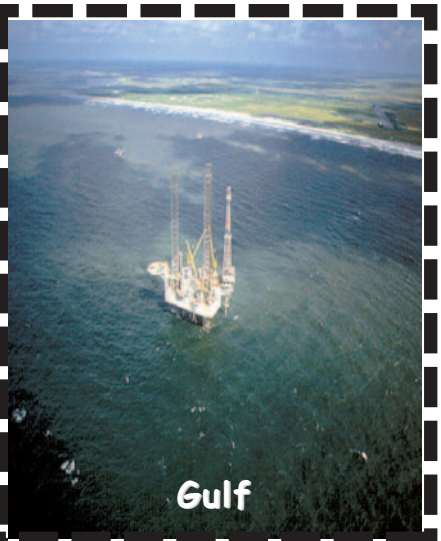
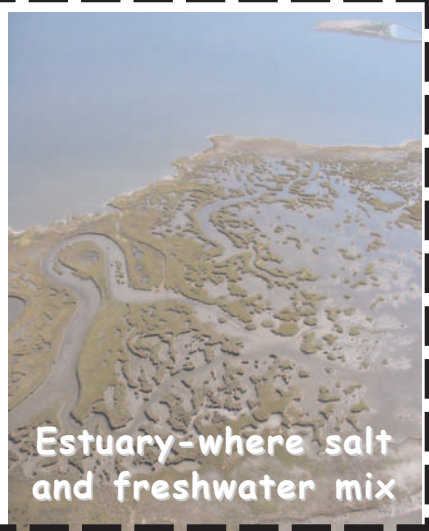




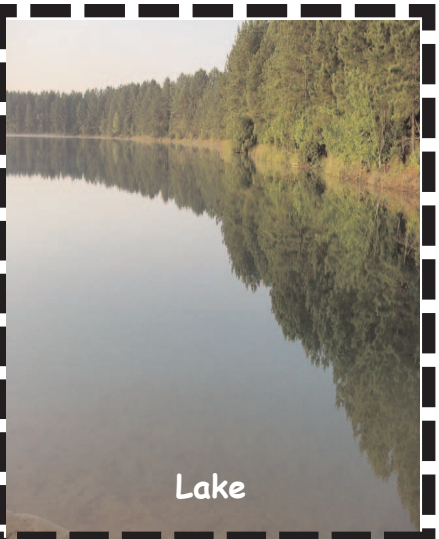
ECO-Bingo Card 12

 Freshwater Marsh	 Sugar Cane Field	 Lake
 Bottomland Hardwood Forest	FREE SPACE	 Barrier Island
 Natural Levee	 Estuary-where salt and freshwater mix	 Gulf

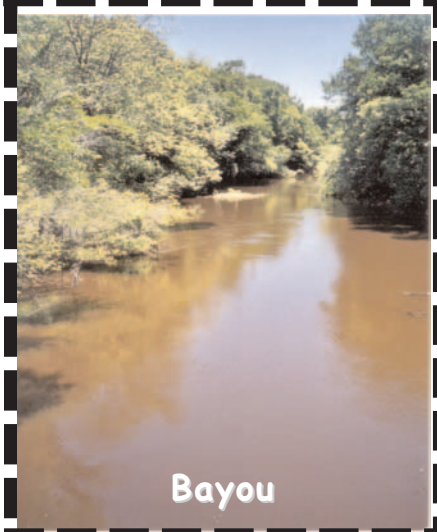
ECO-Bingo Card 13

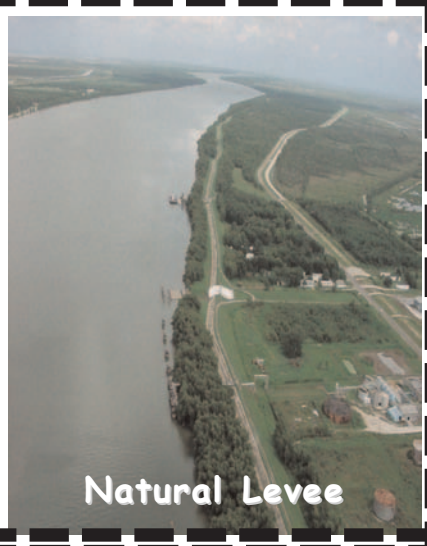
 Bay	 Bayou	 Gulf
 Sugar Cane Field	FREE SPACE	 Salt Marsh
 Intermediate Marsh	 Estuary-where salt and freshwater mix	 Swamp

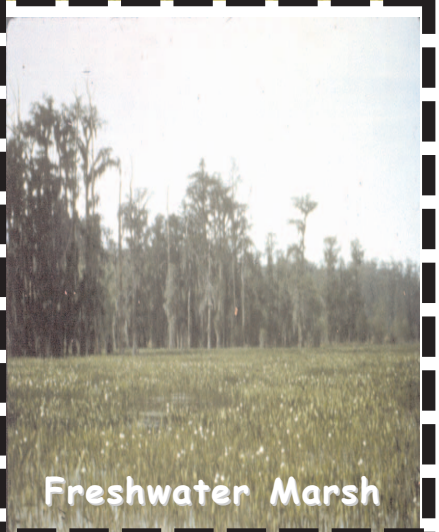
ECO-Bingo Card 14



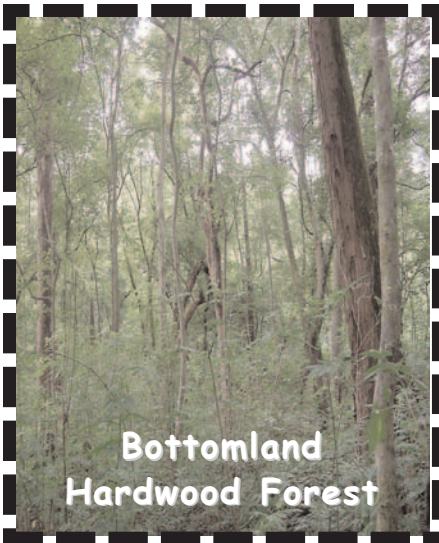
FREE SPACE

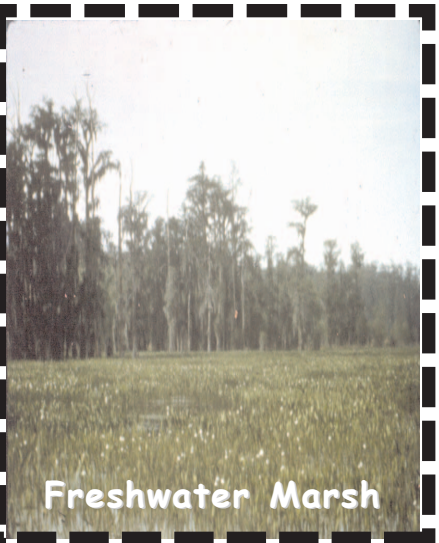


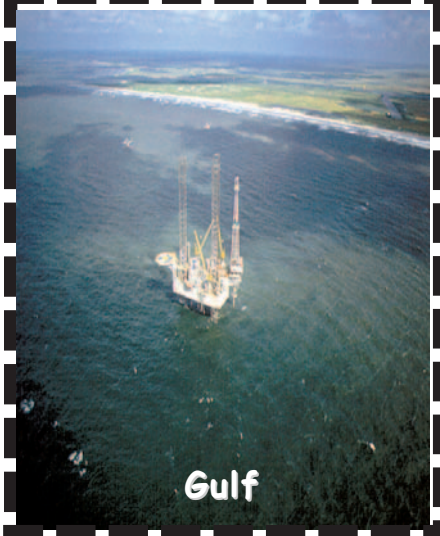




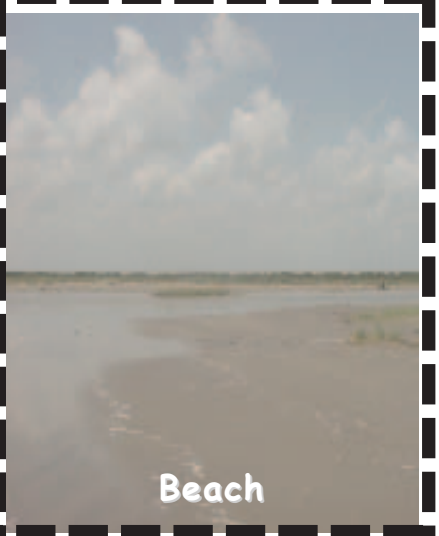
ECO-Bingo Card 15

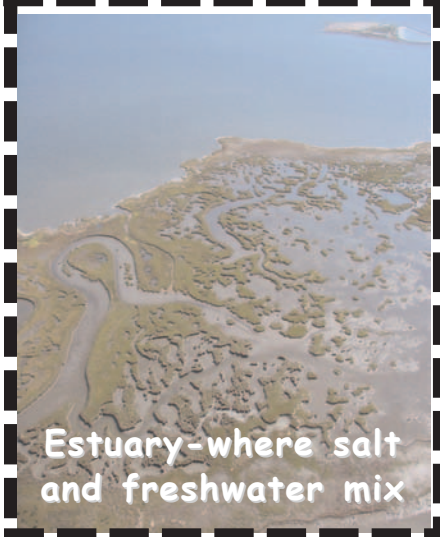




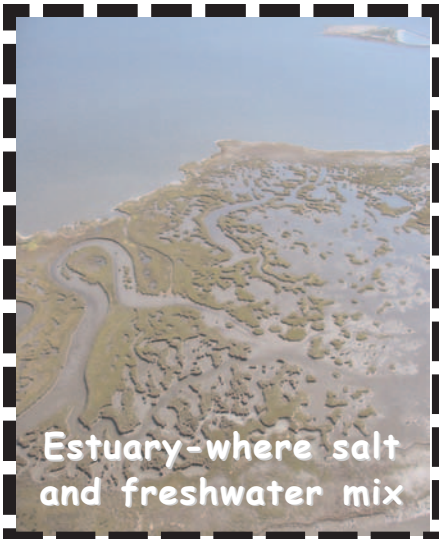


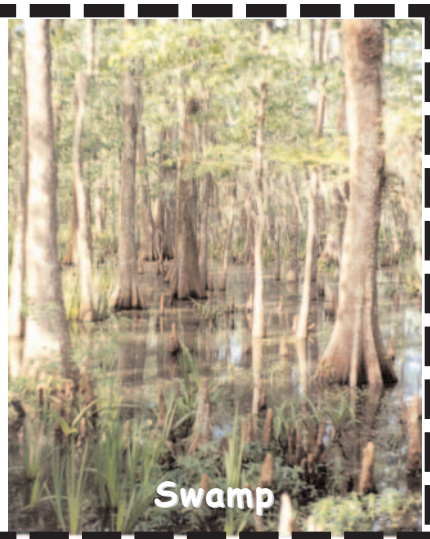
FREE SPACE

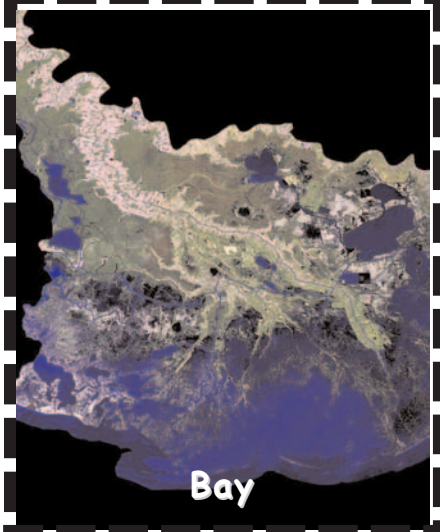




ECO-Bingo Card 16







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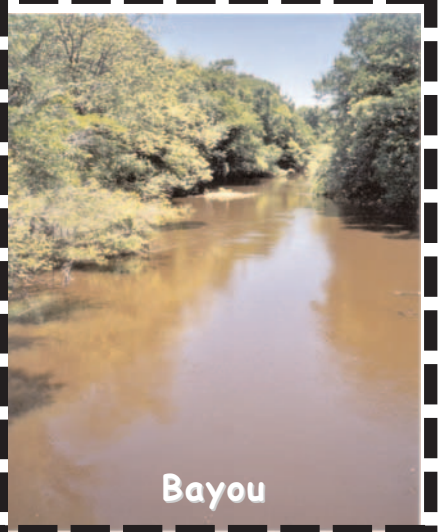
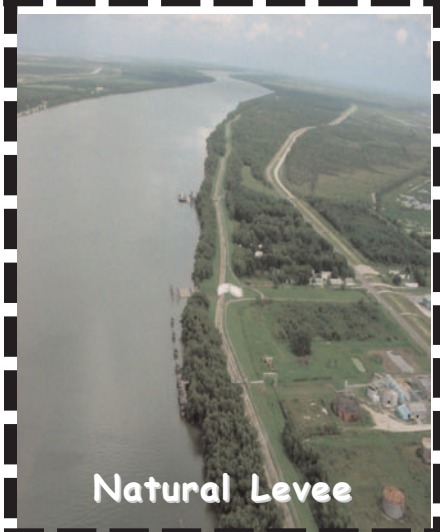
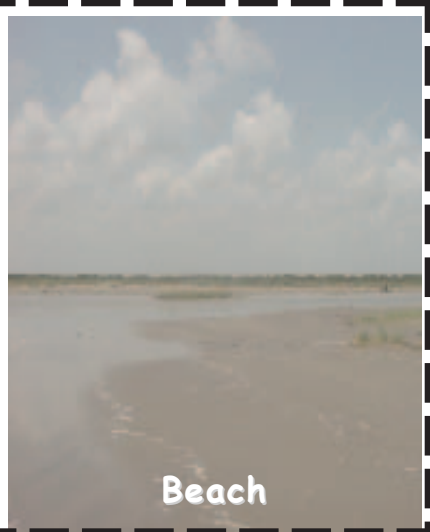
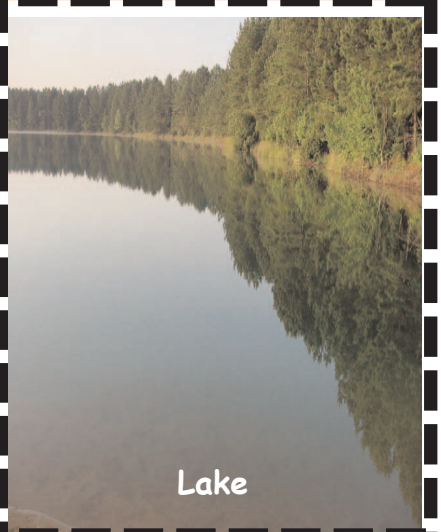
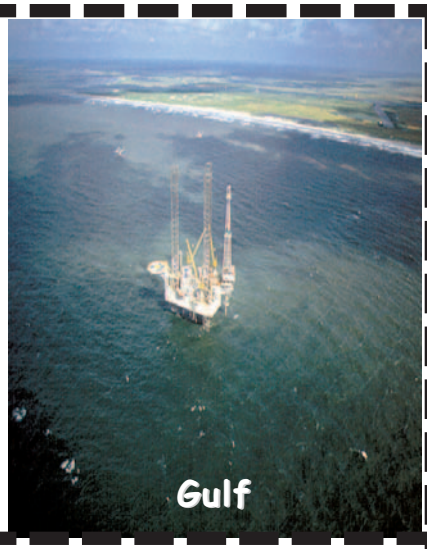


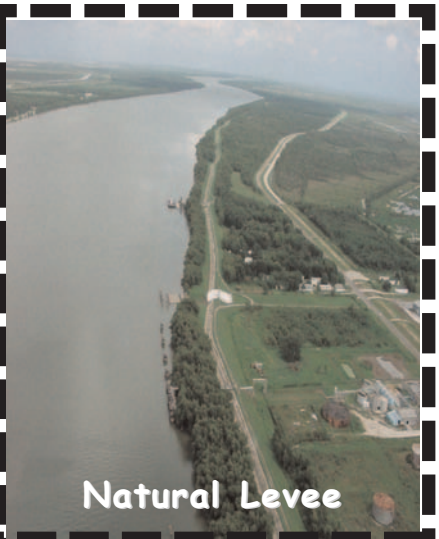






ECO-Bingo Card 17





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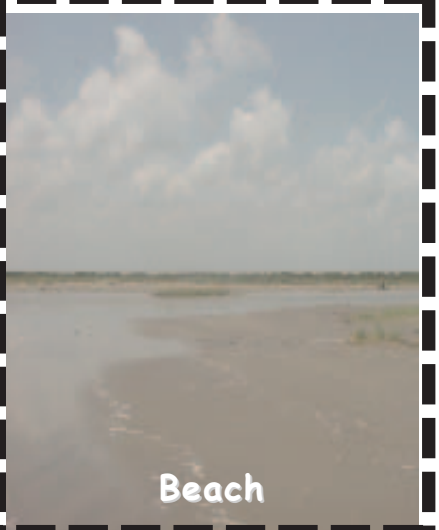

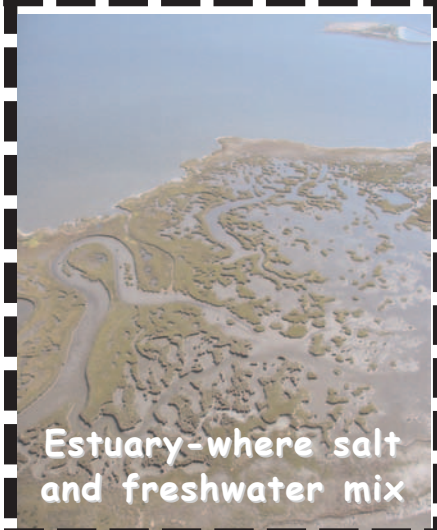

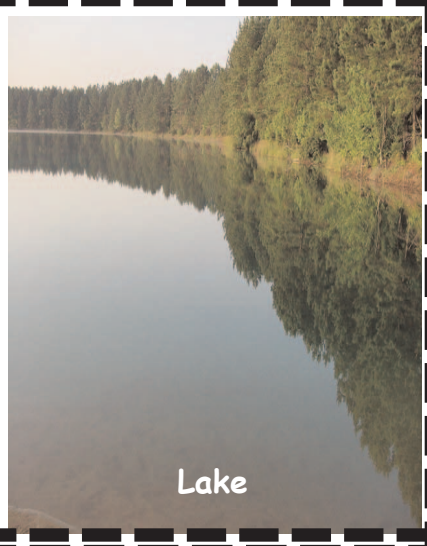

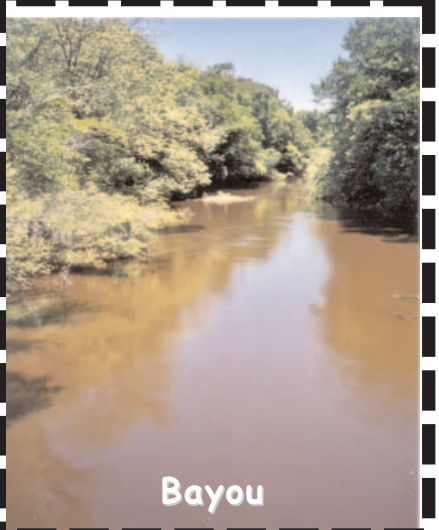

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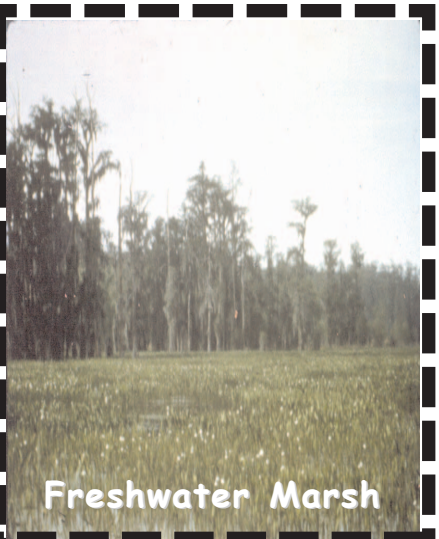

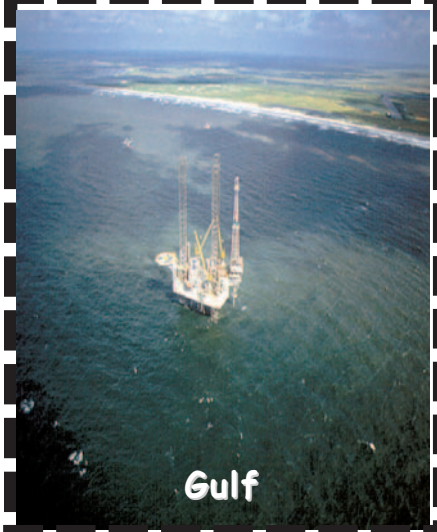

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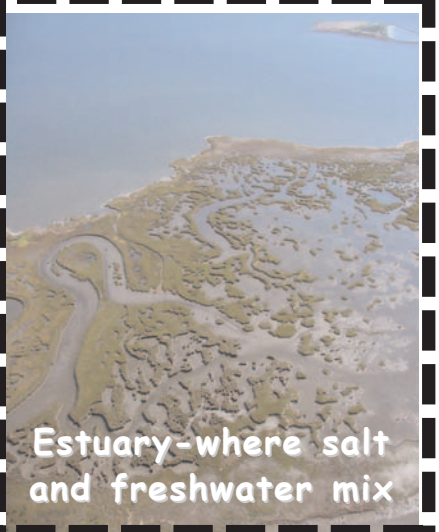

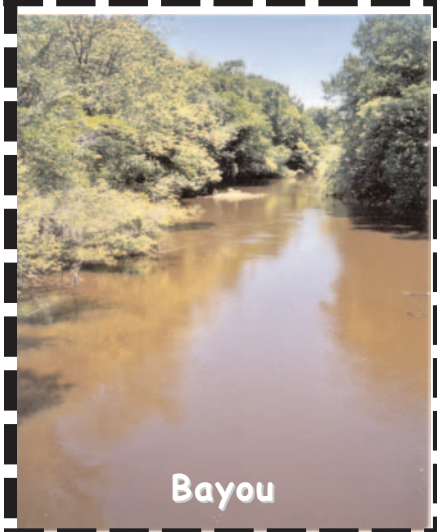

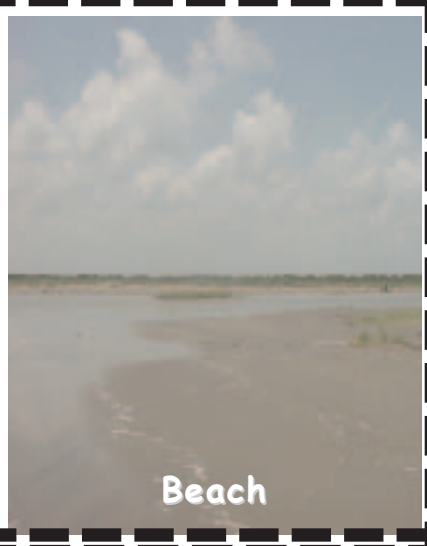

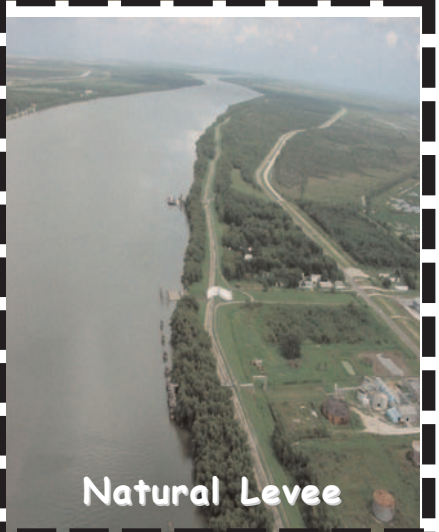

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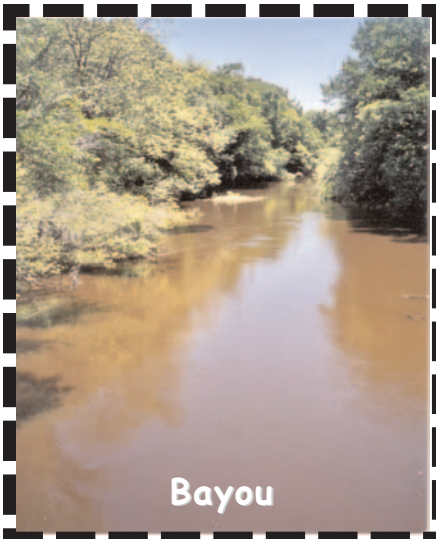

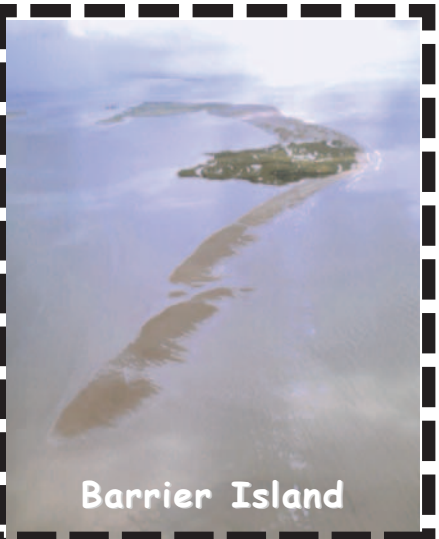

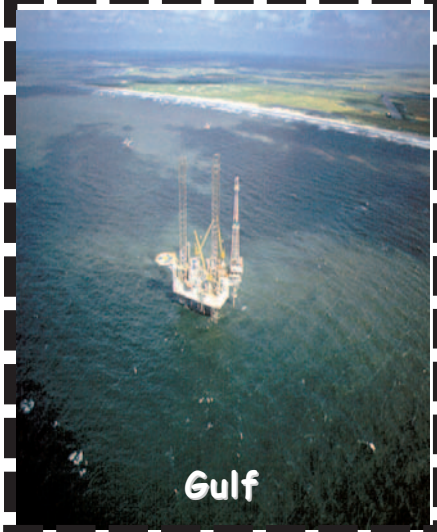

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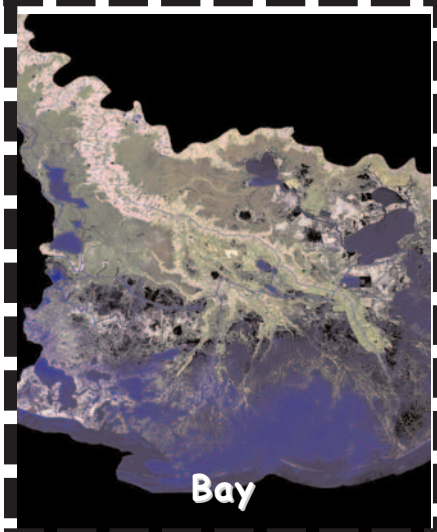

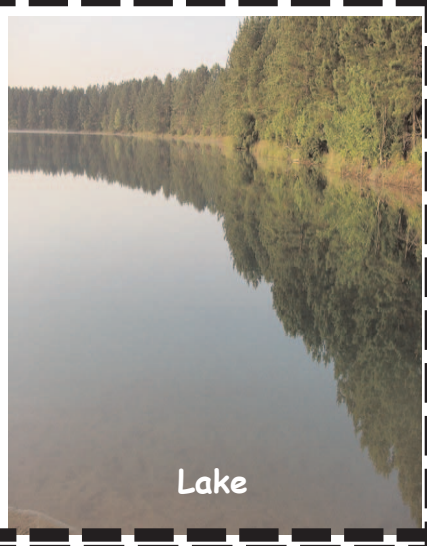

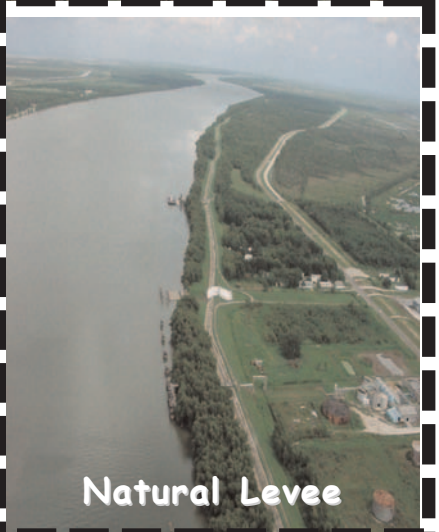

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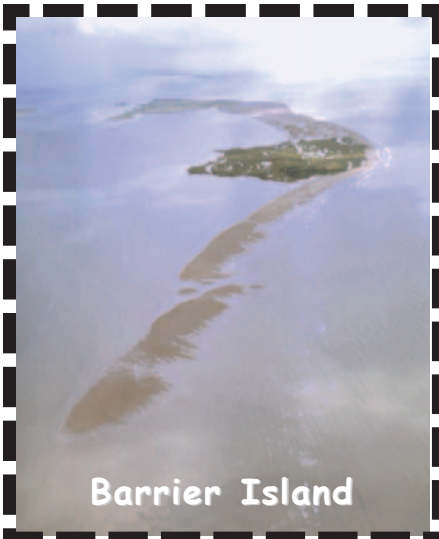

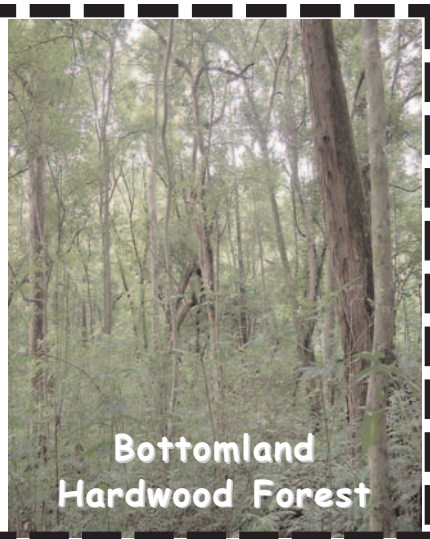

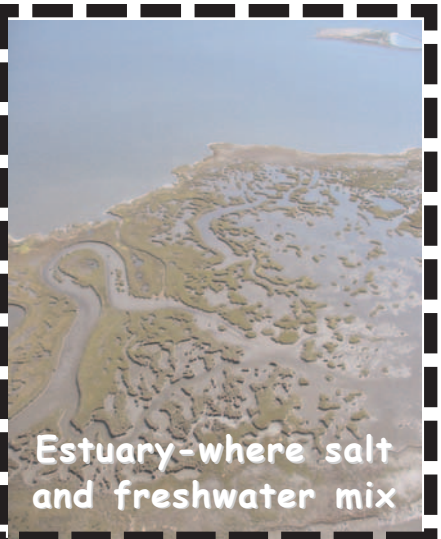

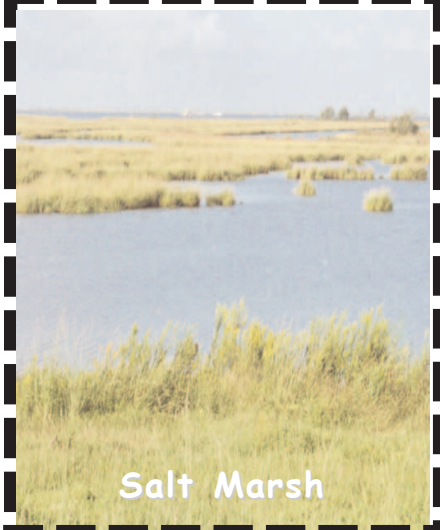

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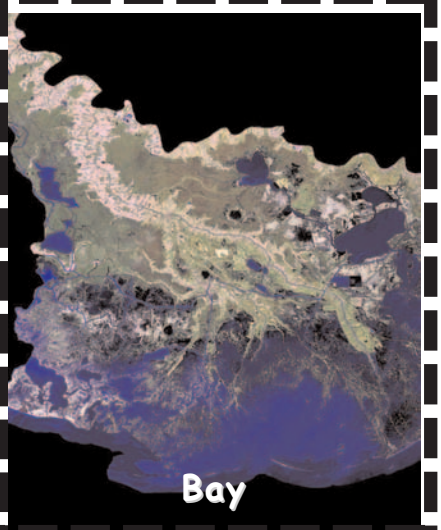


Habitat

Activity 1-9

Wetland Field Trip

How Valuable is This Wetland?

Adapted from *Lessons on the Lake* and
BTNEP/LSU AgCenter: *Wetland Functions, Values and Economic Resources*

Focus/Overview

Students learn best when they can directly experience the environment about which they are learning. This lesson focuses on the functions and values of wetlands by having students make direct observations about these characteristics while in the field.

Learning Objective

The learner will…

- visit and use observation to assess the site's functions and values.

Louisiana Grade Level Expectations (Science)

5: GLE-26	Identify and describe ecosystems of local importance (LS-M-C3).
7: GLE-39	Analyze the consequences of human activities on ecosystems (SE-M-A4).

Materials List

- map of wetland site you will visit
- background information on site
- field guides to wetland plants and animals
- binoculars
- containers, Ziploc bags
- dip nets and/or seine nets
- copies of worksheets
- cameras
- salinity test kit (optional)

BTNEP Connection
Habitat

Grade Level
5, 7

Duration
½ day to full day field trip

Subject Area
science

Setting
field location

Vocabulary
herbaceous, aesthetics

Original Sources
Adapted from *Lessons on the Lake* and BTNEP/LSU AgCenter: *Wetland Functions, Values and Economic Resources,* Activity 13.

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

Background Information

Educational and Research Values of Wetlands

Because of their biological richness and their specialized hydrology and other scientific qualities, wetlands are ideal locations for research and education in the natural sciences. In Barataria-Terrebonne, there are several good examples of field research and education facilities. Louisiana University Marine Consortium (LUMCON; http://www.lumcon.edu) at Cocodrie and the Louisiana Department of Wildlife and Fisheries Marine Lab at Grand Terre Island are two facilities where research and education programs related to the natural resources of the Barataria-Terrebonne estuary take place. In Thibodaux, the National Parks Service's Wetlands Cultural Center introduces the public visiting our area to all the fascinating aspects of the estuary. The Jean Lafitte National Park Barataria Unit near Lafitte, Louisiana, holds educational programs at the learning center and the park attracts local people, out-of-state travelers, and foreign visitors to the wetlands to walk the trails and learn about the ecology of the area. You may know of another area for your students to visit.

Field Trip Tips

If possible, take the students on a swamp tour or a canoe trip with a knowledgeable guide. Either way, it's best to bring the students *into* the wetland, rather than just to the edge of it. Always remember to remind students that safety is the first priority when in the field. This way, they are more likely to see interesting wildlife and gain a deeper appreciation for the ecology and the values of wetlands you have discussed.

Prepare students well before taking the trip. Be sure they understand the values and functions of wetlands so they can apply their knowledge. Go over the worksheets they will be completing either before you leave or as soon as you arrive at the site so the students understand what they need to do.

Take along as many adults as possible to help with interpretation and to enable you to break the class into small groups. If possible, hold an orientation meeting for adult chaperones before the trip to familiarize them with the activities, concepts and procedures.

Procedures

1. We have been discussing the functions and values of wetlands. Today we are visiting a wetland area. One task we will complete is an assessment of this wetland to decide how well it is performing the functions and values we talked about. (Pass out the two handouts: **Wetland Habitat Determination worksheet** and the **Wetland Wildlife Inventory**.)
2. First, how do we know this is a wetland? What are the characteristics of a wetland and does this site have those characteristics? (Wetlands are wet at least some of the time – they can be flooded or have water at or near the surface for at least part of the year. Wetlands also have unique soils – *hydric soils*. Hydric soils do not hold much oxygen and are saturated with water most of the year. Wetlands have plants that are adapted to the wet conditions and hydric soils. Plants that don't like having their roots wet do not do well in a wetlands habitat.) Let's first look at the dominant vegetation. What kind of trees or other plants grow here? (Point out the trees or dominant vegetation and identify them – cypress in a swamp, etc. The dominant vegetation will tell what kind of wetland habitat the site represents. Have students record the names of the dominant vegetation on their **Wetland Habitat Determination worksheet**.)
3. What kind of soil does this site have? (Collect soil samples in containers and pass them to each group so the students can look, touch and smell the soil sample.) Is the soil dark brown or black? Does the soil have a lot of decayed organic material? What does it smell like? Is it dry or wet? (Students fill out their observations about the soil samples on their **Wetland Habitat Determination worksheet**.)
4. Do we see a lot of water standing on the ground? So, is this a wetland? What kind of wetland is it? Swamp, freshwater marsh, brackish marsh, salt water marsh? How do we know? (If you have a salinity test, now is the time to have the students do this water quality test. Students record the salinity of the water and type of wetland habitat on their **Wetland Habitat Determination worksheet – Blackline Master #1**)
5. Now, let's look at a map of this area and see what other features there are in the area along with the wetland. (Locate on the map the area of the wetland, the point where you are, features such as levees, building, roads, fields (what are these fields used for? sewage treatment plants, storm water pumps, etc.) How might these features we have listed affect the wetland? How affected by human activity is this wetland? How might the wetland perform some of the functions we have discussed, such as flood protection, pollution control, etc.? Check off the value of the wetlands for these items on your **Wetland Habitat Determination worksheet – Blackline Master #1**. (Discuss how the wetland site performs these functions. Help students decide on the value it represents.)
6. Now we'll inventory some of the living things in the wetland. Use your **Wetland Wildlife Inventory – Blackline Master #2**. Use this checklist to check off some of the plants and animals in this particular wetland. We'll use nets to find out what living things are in the water. (The students may need help in observing and identifying the plants and animals. Consider bringing field guides to help students identify organisms. Although they may be unaccustomed to it, encourage periods of quiet observation. If there is a way of taking a hike along a levee or taking the students into the wetland in a boat or canoes, they are much more likely to see wildlife. As organisms are observed and identified, students should check them off on their inventory sheets. For the dip-netting or seining, you will need a shallow, easily accessible water area. With younger students, adults may want to do the actual collecting, and then the students can observe the catch and identify the organisms using ID sheets or field guide books. After the organisms are caught empty them into a shallow white tray for easy observation.)
7. Now we have learned about the plants and animals that live at this wetland site. We know where it is. We need to decide how it rates in other wetland values areas, such as wildlife habitat, recreational fishing, aesthetics and educational value. How do you think this site rates for wildlife habitat? Check "low," "medium," or "high" value on your worksheet under wildlife habitat. Do the same for aesthetics, which is the same thing as beauty. What about educational value? Is this a good site for learning about wetlands? Was it easy to get here? Is it a safe place? Rate this side for educational value.

Blackline Masters

1. **Wetland Habitat Determination Worksheet**
2. **Wetland Wildlife Inventory**

Assessment

- Students can create a concept map about the protective nature of the marsh during storms.

Extension

Science

Have students collect plant samples to create their own field guide of wetland plants.

Resources

BTNEP Resources:

Tradebooks:

Brewer, Duncan. 2003. **Wetlands (Biomes Series)**. Thameside Press. 57pp. ISBN: 1593891261.

The Biomes series looks at some of the Earth's major life zones: the natural networks of living things found in different regions of the world. Each title opens with one person's experiences, then considers how plants and animals interact with their surroundings. The book goes on to examine the human impact on the biome. Throughout, special debate panels invite the reader to discuss selected issues. Wetlands are vital water stores and support a range of wildlife found nowhere else, but people often view them as places that should be drained and put to other uses. This book looks at how wetlands work, and at the impact human activities have had on them. Many wetlands are damaged or have disappeared -- do we want to save them? If so, how should we go about it? Age Range: 6 to 9.

Galko, Francine. 2002. **Wetland Animals**. Heinemann. ISBN: 32pp. ISBN 1403404437

Describes wetlands, the different kinds of animals that can be found in them, and their ecological importance. Age Range: 5 to 7.

Taylor, Dave. 1995. **Endangered Wetland Animals.** Crabtree Publishing Company. 32pp. ISBN: 0865055408.

Ten endangered animals are highlighted in each book with clear, simple text matched by stunning, full-color photographs by renowned wildlife photographer and author Dave Taylor. Each book helps guide the reader toward a greater understanding of the dangers these animals face as their habitats are continually degraded and destroyed. Age Range: 7 to 8.

Websites:

CDs

Louisiana Wetland Functions and Values CD developed by LSU AgCenter's Extension Service in conjunction with the U.S. Geological Survey's National Wetlands Center and the Louisiana Department of Natural Resources (DNR). To receive a copy, contact DNR (800/ 267-4019) or order on the Internet at http://www.lacoast.gov.

References:

Tiner, Ralph W. 1998. **Field Guide to Coastal Wetland Plants of the Southeastern United States**. 328 pp. University of Massachusetts Press ISBN: 0870238337 1998

Blackline Master #1

Wetland Habitat Determination Worksheet

Name of the field trip location _____

1. **Water and Soil Determination**
   Name two species of dominant vegetation: _____, _____
   Organic material present? Yes No
   Smell _____
   Is standing water visible? Yes No
   Is the soil saturated with water? Yes No
   So, is this a wetland? _____

2. **Wetland Type Determination**
   Is the wetland woody (trees present) or herbaceous (grasses with no trees present)?
   _____
   If the vegetation is herbaceous, name the dominant species: _____
   What is the salinity of the water? (circle the correct range)

1-2 ppt	3-9 ppt	10-19 ppt	20-35 ppt
freshwater	intermediate water	brackish water	salt water

3. **Human Impacts Determination**
   What are the human impacts affecting this wetland? _____,
   _____, _____, _____

4. **Wetland Value Determination**
   How well do you think this wetland can provide **flood protection**?
   Low Value Medium Value High Value

   How well do you think this wetland can **filter and absorb pollutants and nutrients** from water entering the wetland?
   Low Value Medium Value High Value

   Referring to you Wetland Organism Checklist, how valuable is this wetland as a **wildlife habitat**?
   Low Value Medium Value High Value

   How valuable do you think this wetland is to people seeking **recreational opportunities** such as fishing, hunting canoeing, etc.?
   Low Value Medium Value High Value

   How would you rate the **aesthetics**, or beauty, of this wetland?
   Low Value Medium Value High Value

   How valuable is this wetland for **educational activities**?
   Low Value Medium Value High Value

   Does the area in which this wetland occurs provide economic benefits from **non-renewable resources**?
   Low Value Medium Value High Value

Blackline Master #2-1

Wetland Plant and Animal Checklist

Field trip location _____ **Date** _____

Wetland Observation Team Members _____

Brackish Marsh

Plants

- ☐ wire grass (marsh hay) cord grass
- ☐ three –cornered grass
- ☐ sea grass
- ☐ marsh elder
- ☐ marsh mallow
- ☐ bull tongue
- ☐ grant bulrush
- ☐ common threesquare
- ☐ deer pea
- ☐ switch grass
- ☐ Walter's millet
- ☐ southern maiad
- ☐ alligator weed

Animals

- ☐ otter
- ☐ white pelican
- ☐ lesser scaup
- ☐ blue-winged teal
- ☐ pintail
- ☐ blue crab
- ☐ brown shrimp
- ☐ menhaden (pogy fish)
- ☐ molly
- ☐ silverside
- ☐ great blue heron
- ☐ great egret
- ☐ white ibis
- ☐ glossy ibis
- ☐ rangia clam
- ☐ oyster
- ☐ copepods
- ☐ mottled duck

Additional Wetland Plant, Animal and Habitat Observations:

Blackline Master #2-2

Wetland Plant and Animal Checklist

Field trip location _____ **Date** _____

Wetland Observation Team Members _____

Bottomland Hardwood and Natural Levee

Plants

- ☐ dwarf palmetto
- ☐ hackberry
- ☐ live oak
- ☐ water oak
- ☐ white oak
- ☐ trumpet vine
- ☐ Chinese tallow(invasive)
- ☐ bald cypress
- ☐ button bush

Animals

- ☐ rabbit
- ☐ armadillo
- ☐ deer
- ☐ opossum
- ☐ raccoon
- ☐ cane break rattlesnake
- ☐ box turtle
- ☐ garter snake
- ☐ speckled king snake
- ☐ barred owl
- ☐ red-tailed hawk
- ☐ turkey vulture
- ☐ crow
- ☐ blue jay

Additional Wetland Plant, Animal and Habitat Observations:

Blackline Master #2-3

Wetland Plant and Animal Checklist

Field trip location _____ **Date** _____

Wetland Observation Team Members _____

Swamp

Plants

- ☐ bald cypress
- ☐ swamp tupelo
- ☐ black willow
- ☐ swamp red maple
- ☐ button bush
- ☐ blue iris
- ☐ smart weed
- ☐ alligator weed
- ☐ pickerel weed
- ☐ bulltongue
- ☐ water hyacinth(invasive)
- ☐ duckweed
- ☐ common salvinia
- ☐ water tupelo
- ☐ pumpkin ash
- ☐ water locust

Animals

- ☐ alligator
- ☐ blue gill
- ☐ mosquito fish
- ☐ giant water bug
- ☐ red eared slider
- ☐ golden silk spider
- ☐ raccoon
- ☐ great blue heron
- ☐ water snake
- ☐ water moccasin
- ☐ spotted gar
- ☐ leopard frog
- ☐ crawfish
- ☐ swamp rabbit
- ☐ nutria
- ☐ red-tailed hawk
- ☐ barred owl
- ☐ bald eagle
- ☐ turkey vulture
- ☐ snowy egret
- ☐ opossum
- ☐ alligator snapping turtle
- ☐ bald eagle
- ☐ freshwater catfish

Additional Wetland Plant, Animal and Habitat Observations:

Blackline Master #2-4

Wetland Plant and Animal Checklist

Field trip location _____ **Date** _____

Wetland Observation Team Members _____

Salt Marsh

Plants

- ☐ oyster grass (smooth cordgrass)
- ☐ black needle rush
- ☐ black mangrove
- ☐ seagrass
- ☐ salt wort

Animals

- ☐ salt marsh snail
- ☐ speckled trout
- ☐ redfish
- ☐ flounder
- ☐ diamond-backed terrapin
- ☐ salt marsh mosquito
- ☐ oyster
- ☐ blue crab
- ☐ oyster drill
- ☐ Atlantic Croaker
- ☐ Bay Anchovy

Additional Wetland Plant, Animal and Habitat Observations:

Blackline Master #2-5

Wetland Plant and Animal Checklist

Field trip location _____ **Date** _____

Wetland Observation Team Members _____

Freshwater Marsh

Plants

- ☐ giant cutgrass
- ☐ bulltongue
- ☐ Roseau cane
- ☐ smartweed
- ☐ maidencane
- ☐ soft rush
- ☐ millet
- ☐ water lily
- ☐ cattail
- ☐ button bush
- ☐ groundsel
- ☐ arrowhead
- ☐ marsh mallow
- ☐ American lotus
- ☐ pickerel weed
- ☐ penny wort
- ☐ Southern wild rice
- ☐ coontail
- ☐ common duckweed
- ☐ spike sedge
- ☐ alligator weed

Animals

- ☐ red-winged blackbird
- ☐ otter
- ☐ bald eagle
- ☐ nutria
- ☐ bull frog
- ☐ cricket frog
- ☐ green tree frog
- ☐ white tail deer
- ☐ lubber grasshopper
- ☐ white ibis
- ☐ glossy ibis
- ☐ great egret
- ☐ snowy egret
- ☐ great blue heron
- ☐ alligator
- ☐ freshwater catfish
- ☐ mottled duck
- ☐ large mouth bass
- ☐ bald eagle

Additional Wetland Plant, Animal and Habitat Observations:

Blackline Master #2-6

Wetland Plant and Animal Checklist

Field trip location _____ **Date** _____

Wetland Observation Team Members _____

Barrier Island/Beach

Plants

- ☐ iva
- ☐ groundsel
- ☐ glasswort
- ☐ oyster grass
- ☐ sea oxeye
- ☐ black mangrove

Animals

- ☐ brown pelican
- ☐ laughing gull
- ☐ tern
- ☐ willet
- ☐ plover
- ☐ sandpiper
- ☐ frigate bird
- ☐ bottle-nosed dolphin
- ☐ speckled trout
- ☐ flounder
- ☐ sheephead
- ☐ fiddler crab
- ☐ hermit crab
- ☐ red fish
- ☐ white shrimp
- ☐ brown shrimp
- ☐ skimmer
- ☐ Atlantic croaker
- ☐ oysters
- ☐ blue crab
- ☐ striped mullet
- ☐ reddish egret
- ☐ menhaden (pogy fish)

Additional Wetland Plant, Animal and Habitat Observations:

Habitat

Activity 1-10

Coastal Land Loss: Making Sense of it All

BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*

Focus/Overview

Students will understand the complex causes and effects of coastal land loss better if they conduct their own investigations and organize the information in a way that is personally meaningful. In the process of creating a concept map and then explaining the map to their classmates, the students will gain a deep understanding of coastal land loss and its affects on Louisiana.

Learning Objectives

The learner will…

- classify causes of coastal land loss into "natural" and "human".
- organize the causes and effects of land loss in Barataria-Terrebonne into a concept map.
- decorate their concept maps, present them to their peers and display them in the school.

Louisiana Grade Level Expectations

3: GLE-58	Describe how humans have had negative and positive effects on organisms and their environments (SE-E-A5).
4: GLE-63	Demonstrate and explain how Earth's surface is changed as a result of slow and rapid processes (ESS-E-A1, ESS-E-A5).
5: GLE-32	Demonstrate the results of constructive and destructive forces using models or illustrations (ESS-M-A7).
5: GLE-33	Identify processes that prevent or cause erosion (ESS-M-A7).
5: GLE-50	Describe the consequences of several types of human activities on local ecosystems (SE-M-A4).
8: GLE-53	Distinguish among several examples of erosion and describe common preventive measures (SE-M-A10).

BTNEP Connection
Habitat

Grade Level
3-5, 8

Duration
40 minutes

Subject Area
science

Setting
classroom

Vocabulary
estuary, delta, distributary, abandoned delta, coastal land loss, coastal erosion, wetland loss

Original Source
"Coastal Erosion: Making Sense of It All" in BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*, Activity 1.

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

Materials List

- Overhead transparency of **Causes of Coastal Land Loss in Barataria-Terrebonne (Blackline Master #1)**
- Overhead transparency of **Concept Map of BTNEP's Seven Priority Problems (Blackline Master #2)**
- Copies of student worksheets: **Coastal Land Loss Connections (Blackline Master #3)**
- Copy of teacher information: **Causes and Effects: Making the Connections (Blackline Master #4)**
- BTNEP Priority Posters 1-4 (contact BTNEP for copies)
  #1: Hydrologic Modification
  #2: Sediment Availability
  #3: Habitat Loss & Modification
  #4: Changes in Living Resources
- **Thematic Map/Satellite image of the Barataria-Terrebonne Estuary** (contact BTNEP for copies)
- **Saving Our Good Earth: A Call to Action.** BTNEP Characterization Report (contact BTNEP for copies)

- **Land Loss in Lafourche Parish** brochure, Available from Lafourche Parish Council, 985/ 632-4666.
- Flip chart and easel (butcher paper taped on the wall will work)
- Poster board
- Markers and other materials for making attractive, colorful concept map
- **Vanishing Wetlands, Vanishing Future Video** (Contact BTNEP for copies)

Background

The Barataria-Terrebonne estuary was built over thousands of years as the Mississippi River changed its course through time. This geologically recent land mass is undergoing a great change. Wetland loss issues related to subsidence, hurricanes and storms, canals and navigation channels, introduced herbivores (nutria), flood control structures, development and urban sprawl, and sea level rise, all affect the ecosystem.

Procedure

1. The Barataria-Terrebonne **estuary** is a unique place. (Show students a satellite image of the Barataria-Terrebonne estuary.) Many people visit the estuary because of what it has to offer. What are some reasons people like to visit our estuary? (Students list the reasons why people visit Barataria-Terrebonne estuary, like seafood, wildlife (alligators, waterfowl), fishing, boating, scenery, swamps, music, etc.)
2. Our estuary is unique for another reason. Do you know how the land of estuary was made? It was made by the accumulation of thousands of years' worth of mud from the Mississippi River. For more than 7,000 years, the river has been building a huge **delta** out into the Gulf of Mexico. Before it began building the delta, the land of our estuary was not here. This area was actually under the waters of the Gulf of Mexico! Each time the river flooded, muddy water spread out over the land. When the water went down, the mud and sediment was left behind. That is how most of Louisiana was built. (This would be a good time to show a segment of a BTNEP video focused on how the Mississippi built its delta lobes over the last 7,000 years. Video clips are available for streaming over a computer. Vanishing Wetlands Video Clip 2: Mississippi Delta or video can be obtained from the BTNEP office.)
3. Bayou Lafourche once branched off from the Mississippi River. It is a **distributary** of the larger river, since it carried waters out of the main channel of the Mississippi River. It brought sediment down this way from the river, and every time the river flooded, so did Bayou Lafourche. Scientists estimate that it began to do this about 2,000 years ago. (Display the BTNEP Priority Issues Posters 1-4 in the classroom and discuss each one with the class. Leave the posters displayed for the students to use as they work.)
4. The Lafourche Delta is an **abandoned delta**. Land building is no longer occurring there due to human creation of the levee system. This means the Lafourche delta is actually shrinking now. This shrinking is referred to as **coastal land loss** or **coastal erosion** and sometimes as **wetland loss**. They all mean the same thing. Coastal land loss is a serious problem for everyone in Louisiana and even in other states. (Review what the functions and values are of coastal wetlands so students will understand why losing the coastal wetlands is a very serious issue.) Some of the causes of coastal land loss are natural and some are human. Some we can change to slow the rate of land loss and some we cannot change.
5. Here is a list of the factors causing coastal land loss in the Barataria-Terrebonne estuary. (Show the transparency **Causes of Coastal Land Loss in Barataria-Terrebonne Estuary – Blackline Master #1**)
6. Tell me what you have learned from the video about each of these factors. We'll record this information in a chart. We need to include the cause (the factor causing land loss), whether it is natural or human, the effect the factor has on the coastal wetlands and a possible solution to the problem if there is one. (Record what the students tell you on a flip chart or chalk board. Use four columns: cause, natural/human, effect, solution. Use one sheet for each of the causes of land loss.)
7. Let's start with sediment reduction. Tell me whether it is a natural cause or a human cause, and explain what it is. What effect does sediment reduction have on our wetlands? Give me possible solutions to this problem.
8. What about subsidence? (Go through each of the causes in the same manner.)

9. Now we have six sheets of paper representing important causes of coastal land loss. (Pass out **Coastal Land Loss Connections (Blackline Master #2)**. Before we go on, I want you to solve a puzzle. Wetland loss is a puzzle many people are trying to solve. Understanding the causes and effects is the first step to solving the problem. Draw lines between the columns to link the causes and effects of coastal erosion. (Students link components of coastal erosion on their worksheet.)
11. Our next task is to create a concept map that shows the relationships between the causes and the effects of coastal land loss. A concept map is useful explaining complex information and showing how one thing relates to another. Coastal erosion has several causes, and those causes have several effects. They don't all happen separately in different areas. They happen together and can affect each other, which makes it more complex, especially when you are trying to find solutions. (Have students construct their concept maps. This can be an individual assignment or a small group assignment.) First sketch your concept map on a piece of notebook paper. After I've approved your work, you can transfer your map to a larger sheet of paper and add illustrations to enhance your concept map's information.
12. When concept maps are finished, have students present them and then display the in the classroom or school.

Blackline Masters

1. **Causes of Coastal Land Loss in Barataria-Terrebonne Estuary**
2. **Coastal Land Loss Connections** (teacher answer key provided)
3. **Coastal Land Loss in the Barataria-Terrebonne Basin** (information sheet)

Assessment

- Use the concept maps produced by students at the end of the lesson as a means of assessing their understanding of coastal land loss.

Resources

BTNEP Resources:

- BTNEP Priority Posters 1-4 (contact BTNEP for copies)
- Satellite image of the Barataria-Terrebonne Estuary (contact BTNEP for copies)
- **Saving Our Good Earth: A Call to Action.** BTNEP Characterization Report (contact BTNEP for copies)

Tradebooks:

Billot, Wendy. 2005. **Before the Saltwater Came**. 32pp.

LaLoutre, the grandmotherly otter, gently tells the story of her life in the Louisiana marsh. Readers will learn about the beauty and charm of the wetland and how its gradual disappearance affects the wildlife and plants. http://www.wetlandbooks.com/ Ages: 3+

Garrett, Ann. 1999. **Keeper of the Swamp**. Turtle Books. 40 pp. ISBN: 1890515124

A boy's heritage from his dying grandfather, who protects the alligators of their Louisiana swamp from poachers, is the knowledge of the ways of the swamp and how it should be kept undamaged. Includes informational pages on alligators and swamps. Age Range: 6 to 9.

Somervill, Barbara A. 2004. **Animal Survivors of the Wetlands**. Scholastic Library Publishing. 64pp. ISBN: 0531165914

The American alligator, the brown pelican, and the whooping crane are some of the animals that make the wetlands their home and have faced extinction. Over the years, the existence of these animals has been threatened by hunting, pollution, pesticides, and habitat destruction. This book explores the efforts being made to help these animals survive and thrive. Age Range: 10 to 12.

Blackline Master #1

Causes of Coastal Land Loss in Barataria-Terrebonne Estuary

- Subsidence
- Sea level rise
- Flood control structures on the Mississippi & Atchafalaya rivers
- Canals and navigation channels
- Storms and wave action
- Herbivory
- Development

Blackline Master #2

Coastal Land Loss Connections

Connect the cause of coastal erosion with its primary and secondary effect(s) with labeled arrows. Write "cause(s)" and "lead(s) to" on the arrow shafts.

Cause	Primary Effect	Secondary Effect
subsidence		
canals and navigation channels	sediment and freshwater reduction	
storms	saltwater intrusion	loss of habitat
herbivores	shoreline erosion	
sea level rise	loss of plants	no land building
flood control structures	hydrologic changes	
development		

Blackline Master #2

Teacher Key

Coastal Land Loss Connections

Connect the cause of coastal erosion with its primary and secondary effect(s) with labeled arrows. Write "cause(s)" and "lead(s) to" on the arrow shafts.

Cause	Primary Effect	Secondary Effect
subsidence		
canals and navigation channels	sediment and freshwater reduction	
storms	saltwater intrusion	loss of habitat
herbivores	shoreline erosion	
sea level rise	loss of plants	no land building
flood control structures	hydrologic changes	
development		

Blackline Master #3

Coastal Land Loss in Barataria-Terrebonne Basin

- **Will there be any barrier islands by the year 2030?**
- **Will the towns south of the Houma-Thibodaux area survive?**
- **What will happen to our seafood industry?**
- **How will we protect our properties from hurricanes when the natural protection is gone?**
- **How can today's residents of Barataria-Terrebonne plan for their children's future?**
- **What can the people of Barataria-Terrebonne do to help themselves?**

When you were a middle school student, did you have to try to answer questions like these? Today the students of Barataria-Terrebonne and other parts of Louisiana need to think about these weighty questions. They face a future full of change and uncertainty, and a large issue is the loss of our coastal wetlands, the backbone of much of the economy and the culture of Barataria-Terrebonne, and protection from devastating hurricanes. Today's students need the knowledge and the critical thinking skills necessary for making informed decisions and practicing good stewardship of the rich resources of our coastal wetlands.

Barataria-Terrebonne is disappearing at a faster rate than any place else in the world. In coastal Louisiana as a whole, 25-35 square miles of marsh become open water every year (that's about one football field every 30 minutes!). The average land loss rate in Barataria-Terrebonne is estimated at more than 18 square miles a year, but there are many hot-spots where the loss is much more severe than the average.

If the causes of coastal land loss in Barataria-Terrebonne were simple, there might be a simple solution. But the causes are complex. Many factors contribute to the loss of our coastal habitats. Some are natural geologic processes, and others are caused by human activities. Natural geologic processes that result in coastal land loss include subsidence, sea level rise, storms and wave action, and herbivory. Human activities that result in coastal land loss include flood control structures on the Mississippi and Atchafalaya rivers (e.g. levees, dams), canals and navigation channels, and development.

Barataria-Terrebonne is part of the Lafourche delta lobe, which is part of the huge Mississippi River Delta. The young sediments that make up the land of the Lafourche delta lobe were deposited by the floodwaters of the Mississippi River and Bayou Lafourche beginning about 2,000 years ago. Bayou Lafourche was then a major distributary of the Mississippi River, directing a large portion of the river's flow south to the Gulf of Mexico. Today, even if people had not discovered the bountiful resources of Barataria-Terrebonne and settled there in large numbers, the Lafourche delta would be deteriorating. It is in the erosional phase of its delta-building and degradation cycle, the Gulf of Mexico erodes the barrier islands and headlands of the shoreline.

We have no control over the geologic processes that govern this cycle. But people have made changes that have greatly increased the rate at which the delta is eroding, and these changes are affecting the lives of the people in Barataria-Terrebonne in many negative ways. The human changes include construction of the levees on the Mississippi River and Atchafalaya River, which prevent fresh water and sediments from flowing through the network of waterways that make their way across Barataria-Terrebonne. In addition, canals cut for navigation and oil and gas access have altered the hydrology, or water flow.

These effects were unintentional, but they have had disastrous results, teaching us how fragile the marshes and swamps of Barataria-Terrebonne are. Today, we face a huge challenge. With a strong commitment, careful planning and a large amount of money, the rapid land loss can be slowed. But it will take the involvement of not only government agencies, scientists and decision-makers, but the residents of the Barataria-Terrebonne basins, whose culture and economy depend on the survival of the coastal wetlands.

Habitat

Activity 1-11

Demonstrating Destruction

Adapted from BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*

Focus/Overview

This activity involves students reviewing factors causing coastal land loss and then developing a model to demonstrate how this factor is involved in coastal land loss.

Learning Objectives

The learner will…

- research a causal factor of coastal land loss.
- plan and design a demonstration to show how this factor causes coastal land loss.
- use the demonstration to explain to the class how the researched causal factor contributes to coastal land loss.

Louisiana Grade Level Expectations

3: GLE-58	Describe how humans have had negative and positive effects on organisms and their environments (SE-E-A5).
4: GLE-63	Demonstrate and explain how Earth's surface is changed as a result of slow and rapid processes (ESS-E-A1, ESS-E-A5).
5: GLE-32	Demonstrate the results of constructive and destructive forces using models or illustrations (ESS-M-A7).
5: GLE-33	Identify processes that prevent or cause erosion (ESS-M-A7).
5: GLE-50	Describe the consequences of several types of human activities on local ecosystems (SE-M-A4).
8: GLE-53	Distinguish among several examples of erosion and describe common preventive measures (SE-M-A10).

BTNEP Connection
Habitat

Grade Level
3-5, 8

Duration
3- 40 minutes classes

Subject Area
science

Setting
classroom

Extension Area
science

Original Source
"Demonstrating Destruction" in BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration,* Activity 2.

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

Materials List

- **BTNEP Priority Posters 1-3** (contact BTNEP for copies)
  #1: Hydrologic Modification
  #2: Sediment Availability
  #3: Habitat Loss & Modification
- **Thematic Map/Satellite image of the Barataria-Terrebonne Estuary** (contact BTNEP for copies)
- **Saving Our Good Earth: A Call to Action.** BTNEP Characterization Report (contact BTNEP for copies)
- **Land Loss in Lafourche Parish** brochure, Available from Lafourche Parish Council, 985/ 632-4666.
- **A Commitment to Louisiana's Coastal Wetlands** from Coastal Wetlands Planning, Protection & Restoration Act [CWPPRA] (available from LSU AgCenter and LA Sea Grant College Program).
- Access to the Internet
- Other resources on coastal land loss in Louisiana

Background

Modeling is an important scientific concept. For example, Louisiana State University unveiled a new model of the Mississippi River Delta in December 2003. The "Mini-Mighty" Mississippi River was built so scientists could better understand the outcomes of coast restoration activities. The researchers designed

the model with a horizontal scale of one foot per 12,000 feet and a vertical scale of one foot per 500 feet. The model recreates the lower 76 miles of the Mississippi. Because of the physical and dynamic scaling, the model is able to simulate two years of river time in just one hour, which allows research to run experiments that would take decades in real life in a matter of just a day or two in the laboratory.

Procedure

1. To understand the causes of coastal land loss, it's helpful to demonstrate, with models, how coastal land loss happens. In this activity you will be inventors, engineers, designers and scientists as you figure out how to show your classmates how one cause wetland loss works. We will divide up into seven groups – each group will take one cause of wetland loss. You will research as many details as possible about how the factor causes land loss and then design a model to demonstrate what it learned.
2. Let's discuss what we mean by a model. For instance, if you wanted to demonstrate how the water cycle works, what kind of model could you make to show this to others? (After collecting ideas from the students, you could demonstrate the water cycle by using hot water in a glass container. Place an aluminum pie pan containing ice over the steam coming from the hot water. Watch the steam condense and water droplets drip back into the water in the glass container – you can modify this model to suit your needs.)
3. After you have plenty of information and have made notes about your cause of wetland loss, list ways you could make a model to demonstrate the cause. To choose the best method, think about practical questions such as: Are the materials readily available? Will it take a fairly short time to put together? Will it be easily transportable? Does it require a lot of cleanup afterward? Does it tell the story we want to tell? (Distribute **Researching and designing a Model to Demonstrate Cause of Land Loss in Louisiana - Blackline Master #1**)
4. When you do your demonstration for our class, you can use other visual aids to help explain how your topic contributes to coastal land loss. (Students use the handout to help formulate their model and guide their research.)

Blackline Master(s)

1. **Researching and Designing a Model to Demonstrate Cause of Land Loss in Louisiana**

Assessment

- Use the concept maps produced by students at the end of the lesson as a means of assessing their understanding of coastal land loss.
- Use a rubric to assess student demonstrations of land loss models.

Extensions

Science

Adapt the activity for making models to show restoration methods.

Build a stream table using a large shallow rectangular container raise slightly at one end. Introduce a source of water at the higher end and a drain pipe at the lower end. Fill the container with sand or diatomaceous earth, and experiment with demonstrating land building and erosion..

Resources

BTNEP Resources:

- BTNEP Priority Posters 1-3 (contact BTNEP for copies)
- Satellite image of the Barataria-Terrebonne Estuary (contact BTNEP for copies)
- **Saving Our Good Earth: A Call to Action.** BTNEP Characterization Report (contact BTNEP for copies)

Blackline Master #1

Researching and Designing a Model to Demonstrate Cause of Land Loss in Louisiana

Mississippi River at the Head of Passes and Cubits Gap

Your group's cause of coastal land loss:

_____

Do some preliminary research about your assigned cause of coastal erosion. List the five most important facts about how your topic causes coastal land loss.

1. _____
2. _____
3 _____
4. _____
5. _____

List your research sources of information:

1. _____
2. _____
3. _____
4. _____

What aspect of your topic do you want to highlight in your model or demonstration?

_____

_____

_____

Designing the Demonstration

List three ways to do the demonstration.

1. _____
2. _____
3. _____

Circle the most practical (affordable, easy to demonstrate, etc.) and effective idea listed above.

List the materials you will need to do this demonstration.

List what each member of your group plans to bring to help with the demonstration or model. Each person should bring at least one item to bring to school in the next two days.

Person	Items that need to be brought to school

Sketch your demonstration and/or model on the back of this sheet. Gather the materials and practice the demonstration. Prepare other visual aids that explain how your topic contributes to coastal land loss. Assign tasks for the class presentation.

Habitat

Activity 1-12

Investigating Habitat Change

Adapted from BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*

Focus/Overview

In this lessons, students collect data from a map and an image and determine the percentage of land loss over several periods of time.

Learning Objectives

The learner will…

- analyze the habitat changes shown on Geographic Information Systems (GIS) maps and Corps of Engineers land loss charts.
- make predictions about future changes, given information about choices for habitat restoration.

Louisiana Grade Level Expectations (Science)

5: GLE-32	Demonstrate the results of constructive and destructive forces using models or illustrations (ESS-M-A7)
5: GLE-33	Identify processes that prevent or cause erosion (ESS-M-A7)
5: GLE-50	Describe the consequences of several types of human activities on local ecosystems (SF-M-A4)
8: GLE-53	Distinguish among several examples of erosion and describe common preventive measures (SF-M-A10)

Louisiana Grade Level Expectations (Social Studies)

8: GLE-7	Explain how or why specific regions are changing as a result of physical phenomena (G-1B-M3)
8: GLE-8	Identify and describe factors that cause a Louisiana region to change (G-1B-M4)
8: GLE-17	Identify a contemporary Louisiana geographic issue and research possible solutions (G-1D-M4)

BTNEP Connection
Habitat

Grade Level
5, 8

Duration
60 minutes

Subject Area
science, social studies

Setting
classroom

Extensions
science, language arts, social studies

Vocabulary
metaphor, wetland function

Original Source
"Investigating Habitat Changes in Barataria-Terrebonne" in BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*, Activity 3.

BTNEP Barataria-Terrebonne National Estuary Program
www.btnep.org

Materials List

- **Saving Our Good Earth: A Call to Action.** BTNEP Characterization Report (contact BTNEP for copies) – pages 17, 34, 35, and 36.
- Access to Internet. Go to BTNEP's home page at http://www.btnep.org – download the GIS maps of habitat changes 1956-1990 in freshwater and brackish/salt marsh (optional)
- Corps of Engineers Chart Number 6 (Terrebonne Bay) in the **Land Loss in Coastal Louisiana** series. Technical Report GL-90-2.

Background Information

Our coastal wetlands provide habitats for wildlife and a nursery for seafood species. Coastal wetlands contain extremely rich, diverse habitats, and they support complex food webs of many kinds of organisms. But when we talk to fishermen, trappers and waterfowl hunters of the Barataria-Terrebonne estuary, they tell us things are not the way they used to be. The numbers of animals seem to have diminished. One reason is that as the coastal marshes are lost, so are the habitats for these animals. Watershed pollution has contributed negatively. When marsh turns to open water, the number of species supported by that area is reduced. In this activity, the students will examine habitat change and land cover GIS maps to analyze the habitat changes that have taken place in the past 50 years.

Advance Preparation

1. Obtain copies of the land loss chart for Terrebonne Bay produced by the U.S. Army Corps of Engineers, New Orleans District.
2. Make color copies of the maps on pages 35 and 36 in BTNEP's **Saving Our Good Earth**.
3. Make a transparency or color copy of the map on page 34 of BTNEP's **Saving Our Good Earth**.
4. Make copies of **Investigating Habitat Change in the Leeville Area** - **Blackline Master #1**.
5. Make *transparencies* of **GIS Grid of Leeville - Blackline Master #2**.
6. If Internet access is available, check the maps showing loss of freshwater marsh and saltwater marsh on the BTNEP website [http://www.btnep.org].

Procedure

1. One of the things on which wetland scientists have focused in recent years is making maps of the loss of coastal wetlands. By looking at old aerial photographs and comparing them with modern aerial photography, researchers have created detailed Geographic Information Systems (GIS) maps that can show us a number of different things. They can show us changes in the different wetland habitats over time, and they can show us the change from land to open water. The maps help figure out what factors contributed to land loss in different areas and help plan for restoration. (Use the overhead projectors to show students the map showing rapid land loss rates (page 34 of *Saving Our Good Earth*.)
2. One set of maps produced by the U.S. Army Corps of Engineers covered all of coastal Louisiana. This is a map of part of the Barataria-Terrebonne estuary. The colored areas are where coastal erosion has occurred. The different colors represent different time periods:
   Green = 1930-1956-58
   Gold = 1956-58- 1974
   Purple = 1974-1983
   Blue = 1983-1990
   (Show the Corps of Engineers land loss chart of Terrebonne Bay. Students will need to get as close as possible to the map, unless you can get a transparency made of the areas being studied.)
3. We'll look at two places in the Barataria-Terrebonne estuary and investigate one area more closely. The first is Bayou Perot and Bayou Rigolettes. This is a GIS map of the area. (Show overheads of GIS maps from page 36 of *Saving Our Good Earth* of the Bayou Rigolettes and Bayou Perot area. Next show students the same area on the Corps of Engineers map.)
4. Can someone describe what has taken place in the Bayou Rigolettes and Bayou Perot area during the periods mapped by the Corps of Engineers?
5. This is a GIS map of the Leeville area. (Show students the GIS map of Leeville from page 35 of *Saving Our Good Earth*.) Now let's find the same area on the Corps of Engineers map and see what it tells us about the land loss there.
6. These two areas are both areas of high land loss in Barataria-Terrebonne estuary. You are now going to use the GIS maps to analyze closely what has happened to the land in Leeville. (Organize students into pairs.) You will work in pairs to estimate how much land has turned to open water and to investigate the habitat types represented in Leeville and how they have changed over time. (Pass out the color copies of the GIS map of Leeville and the **GIS Grid of Leeville - Blackline Master #2 –** copied onto transparency film and **Investigating Habitat Change in the Leeville Area - Blackline Master #1**). Follow the directions on the worksheet. When you finish, see me about using the computer to access more GIS maps on the Internet that will show us more about coastal land loss in the Barataria-Terrebonne Estuary. (These maps are available from http://www.btnep.org.)
7. When the students have finished, conduct a wrap-up discussion about what they found in the two areas. Make comparisons between bayous Rigolettes and Perot and the Leeville area. Ask the students to try to estimate the main cause of loss in both areas

Blackline Masters

1. **Investigating Habitat Change in the Leeville Area**
2. **GIS Grid of Leeville**
3. **GIS Grid of Bayou Perot and Bayou Rigolettes**

Assessment

- Have students create a concept map summarizing the changes they recorded from the various maps they looked at.

Extensions

Language Arts:

Write an imaginary journal entry by a fisherman in 1945 after a day of fishing in one of the small lakes shown near the center of the Leeville map. Do the same for a fishing trip to the same place in 1989. Describe the differences the fishermen see and their feelings about these differences.

Science:

Describe the differences between the loss of freshwater marsh and saltwater marsh shown on the two GIS maps available on the BTNEP home page (http://www.btnep.org). Why do you think the patterns of land loss you see are so different?

Make a list of freshwater marsh plants and a list of saltwater marsh plants. Which is the longer list? Why? Draw a picture of each plant on your list.

Social Studies:

Talk to a parent, great-uncle or aunt, or someone in their age group. Ask them to tell you about memories of the wetlands of Barataria-Terrebonne (or other Louisiana coastal wetlands) when they were young. Record the conversation.

Resources

BTNEP Resources:

Portrait of an Estuary, publication by LSU AG and BTNEP
Saving Our Good Earth: A Call to Action. BTNEP Characterization Report (contact BTNEP for copies).

Websites:

Louisiana Department of Natural Resources, ***Louisiana Coastal Facts***, accessed July 26, 2004, at http://www.savelawetlands.org/site/webfactsheet.pdf

CDs

Louisiana Wetland Functions and Values CD developed by LSU AgCenter's Extension Service in conjunction with the U.S. Geological Survey's National Wetlands Center and the Louisiana Department of Natural Resources (DNR). To receive a copy, contact DNR (800/ 267-4019) or order on the Internet at http://www.lacoast.gov.

References:

Britsch, L. D., and E. B. Kemp, III. 1990. Land loss rates. Report 1, Mississippi River Deltaic Plain. U.S. Army Corps of Engineers, Waterways Experiment Station, COE Technical Report GL-90-2. Vicksburg, Miss. 35 pp.

Coalition to Restore Coastal Louisiana. No date. **No Time to Lose**: **Facing the Future of Louisiana and the Crisis of Coastal Land Loss.** . Accessed 4/13/05 at http://www.crcl.org/no_time_to_lose.pdf.

Blackline Master #1

Investigating Habitat Change in the Leeville Area

LA 1 Bridge in Leeville, Louisiana

Look at the two GIS maps of Leeville. One represents what the area looked like in 1945 and the other is how it looked in 1989. The colors represent types of land cover. Class I is solid marsh and Class IV is broken up marsh.

PART A

Examine the 1945 map and use the color coding and legend to answer these questions:

1. What type of land cover is the majority of the map covered by? _____
2. Is there any Class IV land cover? _____
3. What evidence of features made by humans is shown on the map? _____
   What type of features are they? _____

PART B

Examine the 1989 map and answer these questions:

1. What type of land cover is most common in 1989? _____
2. Which type of land cover (color) has been lost more than any other? _____
3. Which type of land cover (color) has increased more than any other? _____

PART C

Take your transparency GIS Grid and place it over the first map. By estimating how many squares are occupied by a type of land cover or open water, you can figure the percentage of the map taken up by those types. Where you see parts of squares, try to estimate the number of total square those parts would make if put together. For example, if 78 squares are occupied by dark green (Class I land cover) or solid marsh and there are 160 squares on your grid, you can calculate the percentage of land cover with the following calculation: 78/160 X 100 = 48.75%.

Answer these questions:

1. On the 1945 map, what percentage is Class I land cover (i.e., solid marsh)? _____
2. What percentage is open water? _____
3. How many canals (red lines) are there? _____

PART D

Now lay your GIS Grid transparency over the 1989 map and answer these questions:

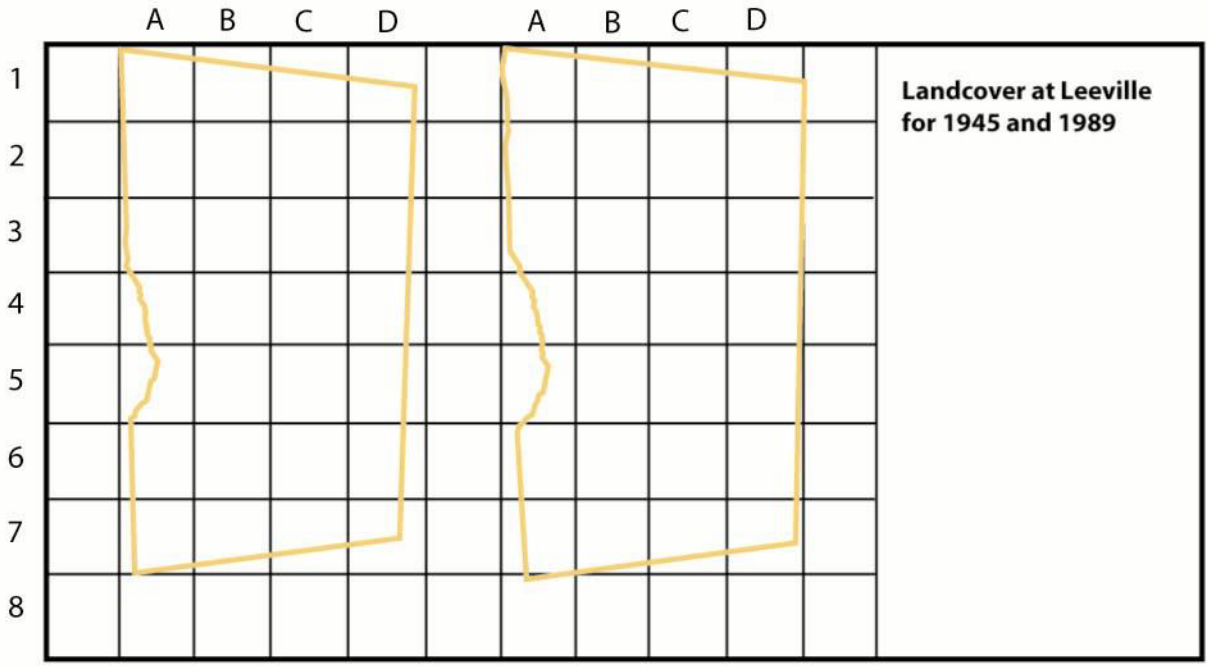
1. About what percentage of the map is now Class I land cover (i.e., solid marsh)? _____
2. What percentage is open water? _____
3. What percentage is Class IV land cover? _____
4. How many canals (red lines) are there? _____

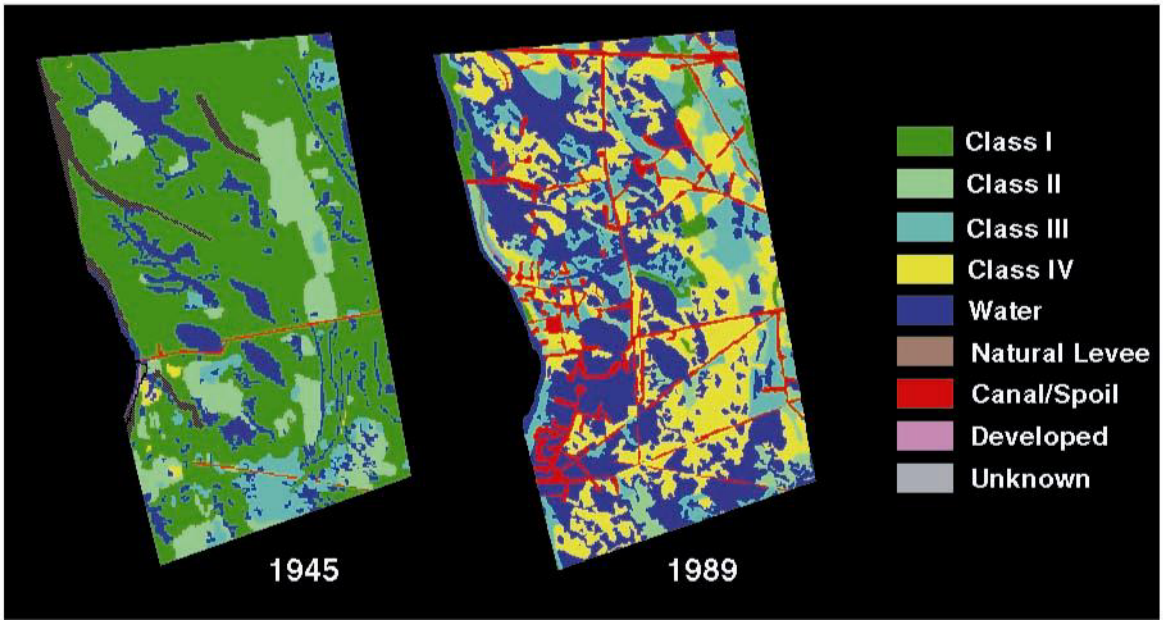
Part E

1. Which land cover was lost more than any other between these two time periods? _____
2. Which land cover gained more than any other between these two time periods? _____
3. What human features increased? _____
4. What effects do you think these changes had on the appearance of the landscape? _____
   _____
   _____
5. List possible causes of these changes. _____
   _____
   _____
   _____
6. How might the changes affect wildlife and seafood species? _____
   _____
   _____
   _____
   _____
7. How do you think the local residents and fishermen view the changes? _____
   _____
   _____
   _____
8. What solutions would you suggest for this land loss problem in the Leeville area? _____
   _____
   _____
   _____
9. Below, draw a sketch of what you think the map will look like in the year 2030 if no successful solutions are found.

Blackline Master #2

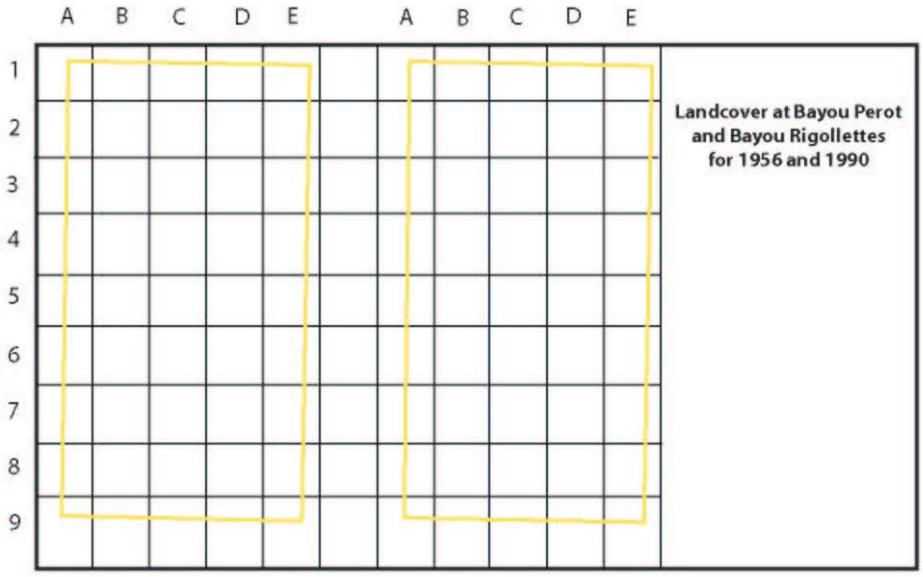
GIS Grid of Leeville Area

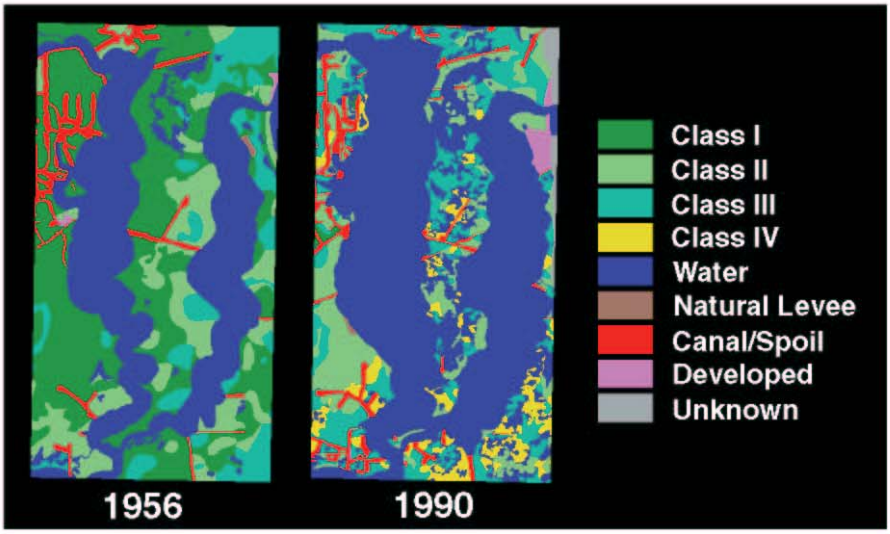




Blackline Master #3

Grid of Bayou Perot and Rigolettes





Habitat

Activity 1-13

Issue Analysis & Decision Making

Adapted from BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*

Focus/Overview

Students will use their knowledge of causes and effects of wetlands loss and problems associated with potential restoration options to discuss the risks and benefits of a freshwater diversion project.

Learning Objectives

The learner will…

- research viable coastal restoration methods using published documents and the Internet.
- use issue analysis and conflict resolution methods to make a group decision about the merits of a freshwater/sediment diversion project.
- develop and act out a role-playing skit of a CWPPRA meeting to discuss a freshwater/sediment diversion project.

Louisiana Grade Level Expectations (Science)

7: GLE-39	Analyze the consequences of human activities on ecosystems (SE-M-A4).
8: GLE-20	Describe how human's actions and natural processes have modified coastal regions in Louisiana and other locations (ESS-M-A8).
HS Env Sci: GLE-21	Analyze the effect of common social, economic, technological, and political considerations on environmental policy (SE-H-C3).
HS Env Sci: GLE-22	Analyze the risk-benefit ratio for selected environmental situations (SE-H-C4).

BTNEP Connection
Habitat

Grade Level
7, 8, HS Env. Sci

Duration
3 days

Subject Area
science

Setting
classroom

Vocabulary
stakeholder

Original Source
"Issue Analysis/Decision Making" in BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*, Activity 6.

BTNEP Barataria-Terrebonne National Estuary Program
www.btnep.org

Materials List

- Access to Internet (optional)
- Publications dealing with coastal restoration issues, including: Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA): A commitment to Louisiana Coastal Wetlands (published by the LSU AgCenter and Louisiana Sea Grant College Program)
- Overhead projection transparencies of 50-year and 100-year land loss projection maps (provided on pages 6 and 7 of this activity)
- Barataria-Terrebonne Satellite Image (available from BTNEP) or the Oil Spill Contingency Map of Louisiana (available from the Oil Spill Coordinator's Office at LSU)

Background Information

Restoring Louisiana's vanishing coastline is a complex problem with a variety of solutions. Coastal restoration actions researched in this activity include diversions, restoring natural water flow, vegetative plantings, barrier island and shoreline restoration and beneficial use of dredged material as in pipeline slurry. Stakeholder groups such as fisherman, oil and gas companies, and navigation and shipping industries all have a vested interest in these restoration techniques. Groups do not always agree on restoration actions. This activity is designed to allow students an opportunity to explore problems, state a position, and determine if the technique is acceptable.

Advance Preparation

1. Make transparencies of the land loss maps (see maps, pages 6 & 7).

Procedure

1. Let's look at land loss on Louisiana's coastline. This USGS map, **100+ Years of Land Change for Coastal Louisiana Map (Blackline Master #3**) shows us what scientists at USGS predict the coastline will look like in by 2050 (within your lifetime). How will this change affect your lives and the lives of your children? How will life change as the marshes turn to open water?
2. Now look at the map that shows how the coast in the Barataria-Terrebonne National Esturay (**Southeast Louisiana Land Loss - Blackline Master #4**). You can see how the white areas are where the people live – along the ridges. There will be little solid land where the marshes are today. Only the ridges or higher elevation areas will remain. What will it mean to Louisiana citizens in the 2100's? How will their lives be different from ours because of this land loss?
3. These maps project what might happen if no action is taken to slow coastal erosion. Actually, scientists and engineers have developed methods that can effectively restore our coastal wetlands. [Distribute copies of CWPPRA's ***A Commitment to Louisiana's Coastal Wetlands***]. This booklet explains the values of our coastal wetlands, the causes of coastal land loss, the future if we take no action, potential restoration plans and how they may affect the future. Find the heading "Future with Action." What are the four recommended restoration actions? (freshwater/sediment diversions, vegetative plantings, hydrologic restoration or natural water flow restoration, and barrier island/shoreline restoration). Each of these restoration actions is a big topic! We'll divide into four groups and each group will research one of the restoration actions and report back to the class what they have found out.
4. Have student groups prepare brief reports about each of the four restoration methods. Distribute **Restoration Action Options (Blackline Master #1)** to assist students in researching their option.
5. Some of the groups discovered that there is controversy associated with some of the restoration options. The most controversial option is freshwater and sediment diversion from the Mississippi River. We'll look at this option more closely and do an exercise in which you will study the issue and the conflicting opinions and come up with some solutions to the conflict. Then you will decide on a resolution to the conflict. For example, a conflict with freshwater diversion is that it will make the water in the lakes and marshes fresher and push fish and shrimp, which prefer salty water, farther out toward the Gulf of Mexico. Many fishermen say this will hurt their livelihood. There are also other conflicts. Your job is to find other conflicts and resolve the conflict in some way.
6. Finally, our class will create a mock CWPPRA meeting and role play the process of working through the conflict with different members of the community with different opinions. You will need to create the roles, such as a government official who is explaining the project and at least three people from the community (such as a shrimper, an oyster farmer, a wetlands expert, a business owner in town, an environmentally concerned citizen, a teacher, etc.). You can give each person in the role play a fun name, like "Iam Gump" for the shrimper. Pass out the **Restoration Actions Issue Analysis Worksheet (Blackline Master #2)** and go over it with the students. They can use this worksheet to work through the conflict resolution and then develop their role-playing skit of a CWPPRA meeting. Remember the important part of the role play is deciding how your character would feel about sediment and freshwater diversion and then figuring out what you'll say to support your position. The resolution at the meeting must reflect what your group came up with on your worksheet.

Blackline Masters

1. **Restoration Action Options**
2. **Restoration Action Issues Analysis Worksheet**
3. **Projected 50-year Land Loss Map**
4. **Projected 100-year Land Loss Map**

Assessment

- Prepare a rubric for (1) student participation in role play, (2) representation of assigned group's position, and (3) research into group's position.

Extensions

Language Arts:

Have students write a letter to the Governor, the State Legislature, Congress, or the President stating reasons for national support of wetland conservation issues. Include support of why some people consider Louisiana's wetland loss a national crisis.

Social Studies:

Use a GIS map comparison of wetland loss over the last 50 years and project loss over the next 50 years. Discuss how this loss will affect the culture and lifestyle of the people in those areas.

Resources

BTNEP Resources:

Portrait of an Estuary, publication by LSU AG and BTNEP

Websites:

United States Geological Survey National Wetlands Research Center - LA Coast website, ***Louisiana Coastal Wetland Functions and Values***, accessed July 27, 2004, at http://www.lacoast.gov/reports/rtc/1997/4.htm

Bill Sipple, US Environmental Protection Agency**,** Office of Water - Watershed Academy Website, ***Wetland Functions and Values***, accessed July 27, 2004, at http://www.epa.gov/watertrain/wetlands/text.html

Ramsar Convention on Wetlands, ***Background Papers on Wetland Function and Values***. Accessed July 27, 2004, at http://www.ramsar.org/values_sediment_e.htm

Louisiana Department of Natural Resources, ***Louisiana Coastal Facts***, accessed July 26, 2004, at http://www.savelawetlands.org/site/webfactsheet.pdf

CDs

Louisiana Wetland Functions and Values CD developed by LSU AgCenter's Extension Service in conjunction with the U.S. Geological Survey's National Wetlands Center and the Louisiana Department of Natural Resources (DNR). To receive a copy, contact DNR (800/ 267-4019) or order on the Internet at http://www.lacoast.gov.

References:

United States Geological Survey National Wetlands Research Center, ***LA Coast website***, accessed July 27, 2004, at http://www.lacoast.gov

Kesselheim, A.S., Slattery, B. E., Higgins, S., Schilling, M. R. 1995. ***Wow! The Wonders of Wetlands: An Educator's Guide***, Environmental Concern Publisher.

Blackline Master #1

Student Name _____

Restoration Action Options

Restoration Action to be Researched

- ☐ freshwater/sediment diversions
- ☐ hydrologic or natural water flow restoration
- ☐ beneficial use of dredged material or pipeline slurry
- ☐ vegetative plantings
- ☐ barrier island/shoreline restoration

What coastal land loss problem does this action address?

_____

_____

Describe how this option works to achieve its goal.

_____

_____

_____

_____

_____

Draw a diagram to help explain your description above.

_____

_____

_____

_____

Give an example of a CWPPRA project implementing this type of action. This information can be obtained from the CWPPRA home page, http://www.lacoast.gov/cwppra/.

Name of the CWPPRA project: _____

Location of the CWPPRA project: _____

Major land loss problem at this location:

_____

_____

_____

_____

How many acres of wetland will this project restore? _____

What is the cost of the project: _____

Is this project controversial in any way? Yes No If yes, what are the conflicts involved?

_____

_____

_____

_____

What actions can be taken to resolve the conflict (compensation, reduced water flow, etc.)?

_____

_____

_____

_____

_____

Blackline Master #2

Freshwater diversion canal at Davis Pond.

Student Name _____

Restoration Action Issues Analysis Worksheet

The plan for coastal restoration in Louisiana is complex and costly. People have different opinions about projects, depending on how they will be affected. Sediment diversion is a particularly controversial restoration action because of the diverse ways it affects groups living in south Louisiana.

1. Brainstorm the problems that may arise from a sediment/freshwater diversion project.
2. Decide on what group you will represent with regard to this problem. From the list in Question 1, choose the problems that will specifically affect your group.
3. Identify the position that your citizen group would take on sediment/freshwater diversion.
4. What are some acceptable ways of reducing the conflict?

Problems generated by a sediment/freshwater diversion project:	
Group you represent:	
Specific problems that sediment/freshwater diversion projects might cause your group:	
Position your group would take on sediment/freshwater diversion projects.	
Potentially acceptable ways of reducing the conflict for your group	

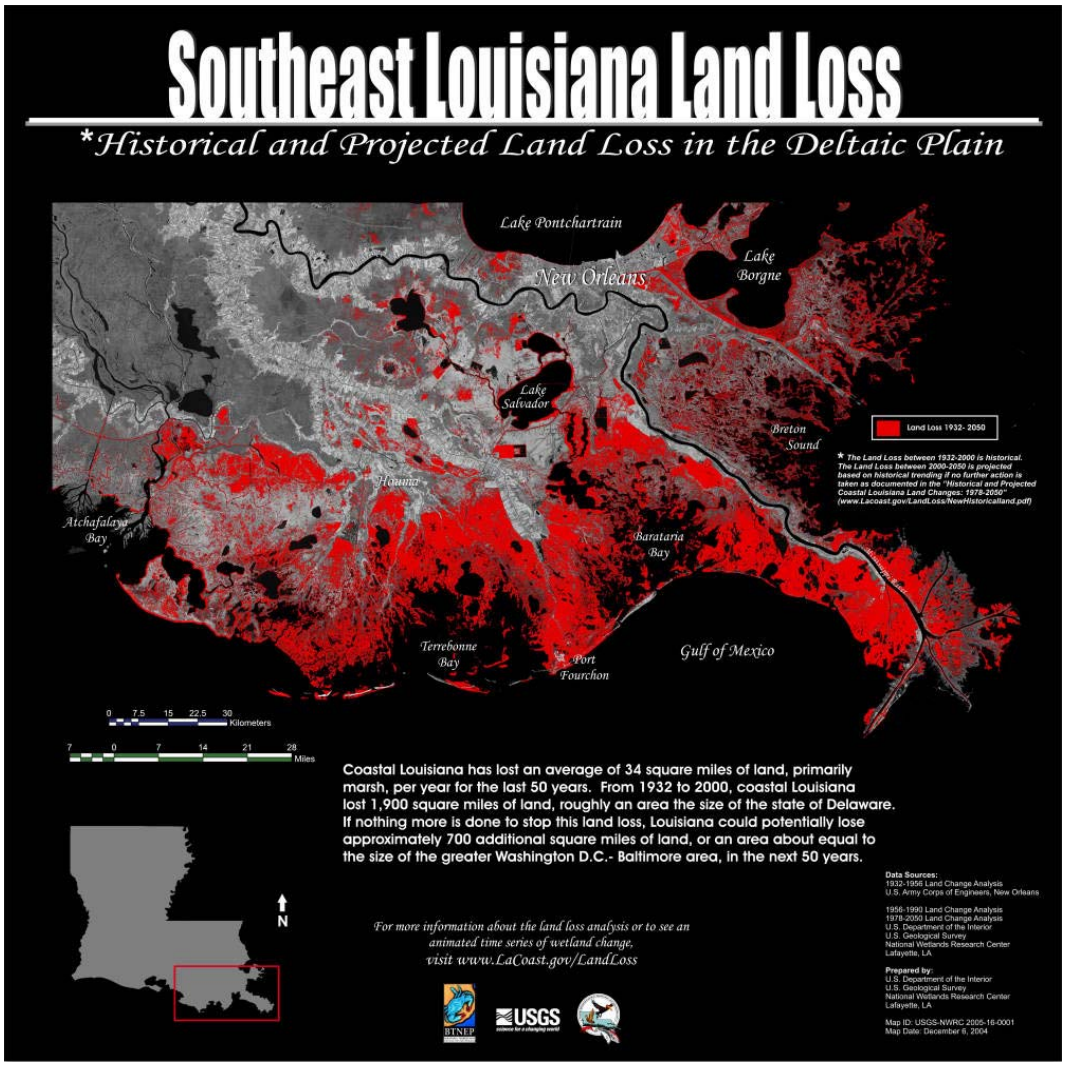
Blackline Master #3

Print or project for students
the United States Geological Survey Map

"100 + Years of Land Change for Coastal Louisiana"

Prints to 11" X 17"

Blackline Master #4



Habitat

Activity 1-14

Coastal Wetlands Need YOU!

Adapted from BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*

Focus/Overview

Students will use their knowledge of causes and effects of wetlands loss and problems to brainstorm ways in which they can contribute to solving and abating the problems associated with coastal land loss and habitat destruction. Students will then create a Citizen Action Brochure outlining an opportunity for citizens to help save and restore Louisiana's wetlands.

Learning Objectives

The learner will…

- identify ways they can help reduce coastal erosion and habitat destruction.
- design a public education brochure explaining how Louisiana residents can contribute to the solutions of coastal land loss.

Louisiana Grade Level Expectations (Science)

2: GLE-48	Describe a variety of activities related to preserving the environment (SE-E-A3).
3: GLE-58	Describe how humans have had negative and positive effects on organisms and their environments (SE-E-A3) (SE-E-A5).
5: GLE-50	Describe the consequences of several types of human activities on local ecosystems (e.g., polluting streams, regulating hunting, introducing nonnative species) (SE-M-A4).
7: GLE-39	Analyze the consequences of human activities on ecosystems (SE-M-A4).
HS Biol: GLE 27	Analyze positive and negative effects of human actions on ecosystems (LS-H-D4) (SE-H-A7).

BTNEP Connection
Habitat

Grade Level
2, 3, 5, 7, HS Biol

Duration
2 days

Subject Area
science

Setting
classroom

Vocabulary
metaphor, wetland function

Original Source
"Coastal Wetlands Need YOU!" in BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration,* Activity 7.

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

Materials List

Information on topics such as the Christmas Tree Project, vegetative shoreline protection options, using native plants for landscaping and migratory birds, school-based plant nurseries (Coastal Roots Project).

Background Information

When faced with the enormous scale of coastal land loss in south Louisiana, it's easy to feel insignificant as an individual, feeling that solving the problem is the job of the scientists and engineers. Each resident of the coastal zone, however, can contribute to the problem-solving process. Some activities with which young people can get involved include recycling Christmas trees, beach sweeps, storm drain marking, removing invasive species, planting native species that help bird populations and planting native vegetation in the marsh. The more students can learn and be involved in the coastal restoration process, the more valuable their skills will be when they become adults. There are many professional opportunities for young people in the restoration field and it's never too soon to start thinking about the future!

Advance Preparation

1. Locate newspaper articles on volunteer opportunities to help save and restore the Louisiana wetlands or visit http://www.btnep.org and click on Volunteers.

Procedure

1. We have a serious coastal land loss and habitat loss problem here in Louisiana. Scientists and engineers are working diligently to find new ways to mitigate and correct these problems. Do you think it is possible for you and I to help solve some of the coastal land loss problems? What are some ways that citizens can help? Write the list on the board or on newsprint. This list will become a master list of topics to research further. You could make it into a handout or have the students write the list in their notebooks or journals. On the list there should be the Christmas tree recycling projects, wetlands vegetation planting projects, ways landowners can preserve wetlands, measure homeowners whose property is on waterways can take to reduce wake erosion of banks, ways homeowners can preserve sand dunes on the barrier islands, storm drain marking, etc. The students will probably add many more to these.
2. We need to understand each of the ways citizens can help with coastal land loss problems in more detail. For instance, we need to find out exactly what someone needs to do to participate in Christmas tree projects. There is more to this project than just putting your tree out on the curb. What can we do in our community to contribute?
3. We will try to learn as much as we can about these topics and then make brochures (or write newspaper articles) that can be used to help educate the public about how they can join the effort to save our coast. Include facts and figures that will convince people that it is worth their time to get involved. Students conduct research using information collected from parish and state coastal management programs, the newspaper, BTNEP, the Internet, etc.

Blackline Master

1. **Louisiana Wetlands Need YOU! Citizen Action Brochure**

Assessment

- Prepare a rubric for student brochures.

Extension

Language Arts:

Have students write a letter to the Governor, the State Legislature, Congress, or the President stating reasons for national support of wetland conservation issues. Include support of why some people consider Louisiana's wetland loss a national crisis.

BTNEP Resources:

Portrait of an Estuary, publication by LSU AG and BTNEP

Websites:

United States Geological Survey National Wetlands Research Center - LA Coast website, ***Louisiana Coastal Wetland Functions and Values***, accessed July 27, 2004, at http://www.lacoast.gov/reports/rtc/1997/4.htm

Bill Sipple, US Environmental Protection Agency**,** Office of Water - Watershed Academy Website, ***Wetland Functions & Values***, accessed July 27, 2004, at http://www.epa.gov/watertrain/wetlands/text.html

Ramsar Convention on Wetlands, ***Background Papers on Wetland Function and Values***. Accessed July 27, 2004, at http://www.ramsar.org/values_sediment_e.htm

Louisiana Department of Natural Resources, ***Louisiana Coastal Facts***, accessed July 26, 2004, at http://www.savelawetlands.org/site/webfactsheet.pdf

CD

Louisiana Wetland Functions and Values CD developed by LSU AgCenter's Extension Service in conjunction with the U.S. Geological Survey's National Wetlands Center and the LA Department of Natural Resources (DNR) [contact DNR (800/ 267-4019) or order at http://www.lacoast.gov].

References:

United States Geological Survey National Wetlands Research Center, ***LA Coast website***, accessed July 27, 2004, at http://www.lacoast.gov

Kesselheim, A.S., Slattery, B. E., Higgins, S., Schilling, M. R. 1995. ***WOW! The Wonders of Wetlands: An Educator's Guide***, Environmental Concern Publisher.

Blackline Master #1

Vegetative planting by volunteers on Wisner Property, at Fourchon, LA

Student Name _____

Louisiana Wetlands Need YOU! Citizen Action Brochure

You are a member of the BTNEP Citizen Volunteer Action Committee. You committee has decided to create a Citizen Action Brochure to encourage citizens to take action to help save and restore the wetlands. Your committee decides that each brochure should (1) explain a particular volunteer opportunity, (2) why this work is needed, and (3) how this work will help the Louisiana wetlands. Below are steps you need to take in your brochure development.

Step 1. Answer two important questions.

1. Who is your target audience? (students, adults, families, businesses, general public, etc.)

   _____

2. What volunteer citizen action do you plan to highlight?

   _____

   Why is this volunteer citizen action necessary? _____

   _____

   _____

   How will this volunteer citizen action help the Louisiana wetlands? _____

   _____

   _____

   _____

3. What is the main message you want your brochure to deliver? _____

   _____

   _____

   _____

Step 2. Create a rough draft of the writing that will go into your brochure. *Is it clear what you want you want people to do and why they should get involved?*

Step 3. Get a classmate to proofread your draft. Besides spelling and grammar questions, this person should answer the following questions for you:

Proofreader: Explain in a sentence or two what it is that the author wants people to be involved in and why citizens should be involved in this effort.

_____

_____

_____

Proofer's signature _____

Citizen Action Brochure (page 2)

Step 4. Collect pictures to illustrate your brochure.

Step 5. Design an attractive heading for your brochure.

Step 6. Decide on a layout for your brochure.

Step 7. Put text, graphics and headings into desired layout of the brochure.

Step 8. Print copies of your brochure.

Step 9. Design a distribution plan for your brochure. Who will you send this brochure to? How will you get it to your target audience?

_____

_____

_____

Habitat

Activity 1-15

The Tragedy of Isles Dernieres

BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*

Focus/Overview

The name Isles Dernieres means "last islands" in French. The history of Isles Dernieres is violent and tragic, befitting their location on the front line of defense on the coast of Terrebonne Parish. Within a few years the broken remains of these islands may disappear from view beneath the waters of the Gulf of Mexico, becoming a submerged sandy shoal. Isles Dernieres figure prominently in the history and folklore of Terrebonne Parish and have been extensively studied by scientists who have documented their erosion in detail. In this activity, the students will explore the history and science essential to unraveling the tragic story of the Isles Dernieres.

BTNEP Connection
Habitat

Grade Level
8, HS Env. Sci

Duration
2-3 class periods

Subject Area
science, history

Setting
classroom

Vocabulary
barrier island

Original Source
"The Tragedy of Isles Dernieres" in BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration,* Activity 9.

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

Learning Objectives

The learner will…

- research the history of Isles Dernieres and construct a timeline.
- write an account of what they learned from their research on one aspect of the history or science of Isles Dernieres.

Louisiana Grade Level Expectations (Science)

8: GLE-53	Distinguish among several examples of erosion and describe common preventative measures (SE-M-A10).
HS Env Sci: GLE-22	Analyze the risk-benefit ratio for selected environmental situations (SE-H-C4).

Materials List

- ***Satellite Image Map of the Barataria-Terrebonne National Estuary***
- ***Louisiana Barrier Island Study – Atlas of Shoreline Change in Louisiana from 1853-1989*** (USGS, 1988; Available on a loan basis from LA Resource Center for Educators (http://www.lrce.org, Baton Rouge).
- ***Willful Winds: Hurricane Andrew and Louisiana's Coast*** (Louisiana Sea Grant, 1996)
- ***Restless Ribbons of Sand: Atlantic and Gulf Coastal Barriers*** (Louisiana Sea Grant College Program; available from the National Wetlands Research Center, Lafayette)

Background Information

Isles Dernieres are one of two major barrier island chains that have helped to protect the marshes of Barataria-Terrebonne from the impact of hurricanes, tropical storms and winter cold fronts. Timbalier Islands make up the other major chain. Because they take the brunt of a storm's energy, barrier islands help to reduce the destructive effects of a storm, such as a hurricane, decreasing the storm surge. The extent of this protective function is not well understood, but it is believed that, as the islands erode, the protection provided diminishes, and the impact of the violent storms on the marshes will be greater, adding to the already serious marsh-loss problems.

Besides their protective function, barrier islands provide a rich habitat for wildlife. Louisiana barrier islands are generally low-lying and support few, if any, trees. They are made up of a sandy beach on the Gulf side, vegetated sand dunes, areas of shrubby vegetation and salt marshes on the landward side. The barrier island ecology also supports a number of wading birds, nesting colonies of brown pelicans and huge numbers of sea birds.

Advance Preparation

1. Locate resource materials.

Procedure

1. Show students the satellite image map of Barataria-Terrebonne. Point out the barrier island chains of Timbalier and Isles Dernieres. What functions and values do the barrier islands provide? (They provide storm protection, wildlife habitat, sheltering bays and providing habitats on the landward side for larvae of seafood species.) What are some of the problems associated with Louisiana barrier islands? (They are constantly changing shape due to various types of erosion – storms, subsidence, sea level rise, and canal construction. All except the last one, canal construction, are natural processes.)
2. Given these problems, what might be the consequences for the inland marshes located north of the barrier islands? (Loss of barrier islands would mean loss of protection from storm surges, loss of wildlife and seafood habitat.)
3. There is great concern that if we lose these islands, erosion will increase rapidly in the marshes and unprotected coastal communities located inland will be much more vulnerable to devastation by a large hurricane. To address this concern, millions of dollars have been spent on barrier island restoration and more needs to be done.
4. In this activity we will mix science and history. Let's take a look at this atlas of barrier island erosion. Show students the ***Louisiana Barrier Island Study – Atlas of Shoreline Change in Louisiana from 1853-1989*** (USGS, 1988). Leaf through the pages so students can see the changing shape and location of the Isles Dernieres barrier island chain.
5. Here is a short excerpt from a New Orleans newspaper article that appeared in 1892:

> By reason of its tragic history, "Last Island" is the most famous of the group. Before the war it was a fashionable summer resort and here was a fine hotel. It has always been a puzzle to me why Last Island was selected for such a purpose, for it is manifestly the lowest, sandiest, and most insecure. It is merely a shark-shaped body of shifting sand, lying almost level with the seas on which it floats like a yellow, faded, lily pad.

   This description of Isles Dernieres was written in 1892 by Catherine Cole, a columnist for the Daily Picayune newspaper in New Orleans. She went on to describe the events in 1856 when a devastating hurricane hit the island and the storm surge destroyed the hotel and village where about 200 wealthy people and their servants were vacationing.

   The stories of the resort and the storm that destroyed it have become an important part of the history of Terrebonne Parish. Discuss the passage with the students, focusing on how Last island became famous, and the author's observation that the island was unsuitable for a resort because of its low, sand, unstable nature. Ask the students to share the image this description creates.
6. We are going to explore the history of Isles Dernieres. What kind of place was it in the 1800's when people vacationed there? What has happened to it over the years? What is it like now? I have resources in the classroom to assist you in this exploration. As you look through these resources, use **Blackline Master #1 – The Tragedy of Isles Dernieres** to guide your research.
7. After you have collected all the information on these topics, your group will put together a timeline for the island. You should start the timeline with the approximate time that the barrier island formed and take your timeline out into the future to 2030 or so.
8. When your timeline is complete, each of you needs to write a short account of one aspect of the history of the Isles Dernieres. Your report needs to be at least two pages. Be prepared to share your report with the class.

Blackline Master

1. **The Tragedy of Isles Dernieres**

Assessment

- Prepare rubrics for the research, timeline and report.

Extension

Science

Allow students to compare other barrier island ecosystems such as the Chandelier Island with Isle Dernieres

BTNEP Resource:

Portrait of an Estuary, publication by LSU AgCenter and BTNEP.

Websites:

Freudenrich, Craig C. How Stuff Works. No date. **How Barrier Islands Work**, accessed July 7, 2005 at http://science.howstuffworks.com/barrier-island.htm.

Topics include: Introduction to How Barrier Islands Work, What are Barrier Islands? Barrier-island Ecology, The Shifting Sands, Changing the Shifting Sands.

Mendelssohn, Irv. LSU Department of Oceanography. No date. **Vegetation and Ecology of Barrier Islands** accessed July 7, 2005, at http://www.biology.lsu.edu/webfac/lurbatsch/BarrierIslands.html.

Description of vegetation types, barrier island zonation, and environmental factors controlling vegetation.

U.S. Geological Survey. May 7, 2001. **Mapping Coastal Change Hazards**, accessed July 7, 2005, at http://coastal.er.usgs.gov/hurricanes/mappingchange/inundation.html

Aerial photos of Isles Dernieres before and after Hurricane Andrew.

Tradebooks:

Wrigh-Frierson, Virginia. 1998. **Island Scrapbook: Dawn to Dusk on a Barrier Island**. Simon & Schuster Children's Edition. 40 pp. ISBN: 0689815638

Before the sun rises, an artist and her daughter slip out of their cottage into the morning air to explore and record the treasures of their North Carolina barrier island. They sketch, paint, and observe the sights around them and as night falls they return to their cottage, bringing back pieces of their island home to compile this scrapbook of a special time and place. Age Range: 6 to 9

References:

Hansen, Gunnar. 1996. **Islands at the Edge of Time: A Journey to America's Barrier Islands**. Island Press. 240 pp. ISBN: 1559632526.

Islands at the Edge of Time is the story of one man's captivating journey along America's barrier islands from Boca Chica, Texas, to the Outer Banks of North Carolina. Weaving in and out along the coastlines of Texas, Louisiana, Mississippi, Alabama, South Carolina, and North Carolina, poet and naturalist Gunnar Hansen perceives barrier islands not as sand but as expressions in time of the processes that make them. Along the way he treats the reader to absorbing accounts of those who call these islands home - their lives often lived in isolation and at the extreme edges of existence - and examines how the culture and history of these people are shaped by the physical character of their surroundings.

Blackline Master #1

Student Name _____

The Tragedy of Isles Dernieres

Picture at left: Aerial photograph of Isles Dernieres, looking westward (Gulf of Mexico to the left).

Formation of Isles Dernieres
Isles Dernieres of the 1850's – What would I have seen if I had vacationed there?
The Storm of 1856 – What would it have been like to experience it?
Erosion of Isles Dernieres – How did one island became four islands?
Impact of Hurricane Andrew on Isles Dernieres
Isles Dernieres of the 2000's – What would you see if you vacationed there today?
The future of Isles Dernieres – Can the island chain be saved?
Barrier Island Restoration Methods

Continue your research on separate paper as necessary.

Habitat

Activity 1-16

A Bayou Journey in 1880

Adapted from BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*

Focus/Overview

Guided imagery is useful for evoking images and allowing the students to feel the mood of the imagery and think in a different way about a topic. This activity can help unlock creative thoughts.

Learning Objective

The learner will…

- understand how the Louisiana landscape has changed over the last 120 years.

Louisiana Grade Level Expectation (Science)

5: GLE-26	Identify and describe ecosystems of local importance (LS-M-C3).

Materials List

- swamp sounds or other appropriate environmental music
- tape recorder or CD player

Background Information:

This guided imagery of Last Island in 1880 transports the listener to the historic past. The selection is written to encourage visual imagery and emotions. Remember, students may prefer to share responses about how they feel in writing.

Advance Preparation

1. Locate and set up tape player/CD player with background music.

Procedure

1. This activity is called a guided imagery exercise. That means I will guide your thoughts by reading a passage that will create many images in your mind. When you read or listen to a story, images flow through your mind. They can be pictures of what is going on, and they can be sounds and even smells. Also, things you hear can make you feel certain emotions. [Turn off the lights and play a tape of swamp sounds or other environmental music.]
2. Take a deep breath and relax. Get comfortable in your chair, take another deep breath, breathe out slowly. Close your eyes and relax. You will listen and concentrate on what the passage tells you. Be aware of the images going through your mind. Read **A Bayou Journey to Last Island in 1880 (Blackline Master #1).**
3. After reading the passage, turn on the lights and ask the students to stretch and become fully alert.
4. Ask students to share their thoughts, mental images and feelings. Use the following guide questions, asking other appropriate questions as needed. To avoid reluctance to share, you can have the students write their responses on cards, collect and share them anonymously with the whole class.
   - What would you have done on the island if you were taking the journey?
   - How did the story make you feel?
   - How would you feel if you could take a journey like the one in the story?
   - What were some of the images you saw in your mind as the story was read?
   - What would be the major differences seen if a young person decided to try the journey today?
   - Would it be possible to make this journey today? If not, why?
   - How would you travel to reach the Isles Dernieres today? In what ways would the islands be different?

BTNEP Connection
Habitat

Grade Level
5

Duration
30 minutes

Subject Area
science, history

Setting
classroom

Extension
language arts

Vocabulary
barrier island

Original Source
"Guided Imagery" in BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*, Activity 10.

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

Blackline Master

1. **A Bayou Journey to Last Island in 1880**

Assessment

- None suggested

Extensions

Language Arts:

- Write a poem about the Isles Dernieres.
- Write an imaginary journal entry telling of a journey to the Isles Dernieres in 1850, and then write an entry for today.

Resources

BTNEP Resources:

Portrait of an Estuary, publication by LSU AG and BTNEP

Websites:

Freudenrich, Craig C. How Stuff Works. No date. **How Barrier Islands Work**, accessed July 7, 2005 at http://science.howstuffworks.com/barrier-island.htm.

Topics include: Introduction to How Barrier Islands Work, What are Barrier Islands? Barrier-island Ecology, The Shifting Sands, Changing the Shifting Sands.

Mendelssohn, Irv. LSU Department of Oceanography. No date. **Vegetation and Ecology of Barrier Islands** accessed July 7, 2005, at http://www.biology.lsu.edu/webfac/lurbatsch/BarrierIslands.html

Description of vegetation types, barrier island zonation, and environmental factors controlling vegetation.

Tradebooks:

Wrigh-Frierson, Virginia. 1998. **Island Scrapbook: Dawn to Dusk on a Barrier Island**. Simon & Schuster Children's Edition. 40 pp. ISBN: 0689815638

Before the sun rises, an artist and her daughter slip out of their cottage into the morning air to explore and record the treasures of their North Carolina barrier island. They sketch, paint, and observe the sights around them and as night falls they return to their cottage, bringing back pieces of their island home to compile this scrapbook of a special time and place. Age Range: 6 to 9

References:

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Islands at the Edge of Time is the story of one man's captivating journey along America's barrier islands from Boca Chica, Texas, to the Outer Banks of North Carolina. Weaving in and out along the coastlines of Texas, Louisiana, Mississippi, Alabama, South Carolina, and North Carolina, poet and naturalist Gunnar Hansen perceives barrier islands not as sand but as expressions in time of the processes that make them. Along the way he treats the reader to absorbing accounts of those who call these islands home - their lives often lived in isolation and at the extreme edges of existence - and examines how the culture and history of these people are shaped by the physical character of their surroundings.

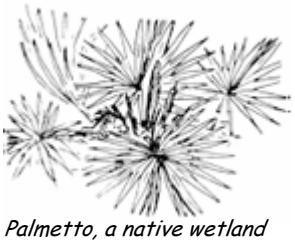
Learning Point Associates, North Central Regional Educational Laboratory, no date, **Adolescent Literacy: Instruction, Reading Strategy: Guided Imagery**, accessed July 7, 2005 at http://www.ncrel.org/litweb/adolescent/strategies/guided.php.

Blackline Master #1

Guided Imagery Reading:

A Bayou Journey to Last Island in 1880

Imagine it is the summer of 1880. You are 14 years old and it is summertime. You have been working at the sugar plantation but have decided to take a break and ride your horse down the bayou ridge of Bayou Sale to see if you can reach Isles Dernieres. You have hear it's easy if the conditions are right, and that the fishing is good there. You don't have a boat, so traveling to the island that way is not possible. As you set off, you're excited to be out alone on a journey you have never before taken.



Palmetto, a native wetland plant.

Image Credit: www.gardenadventures.com/palmsp3.gif

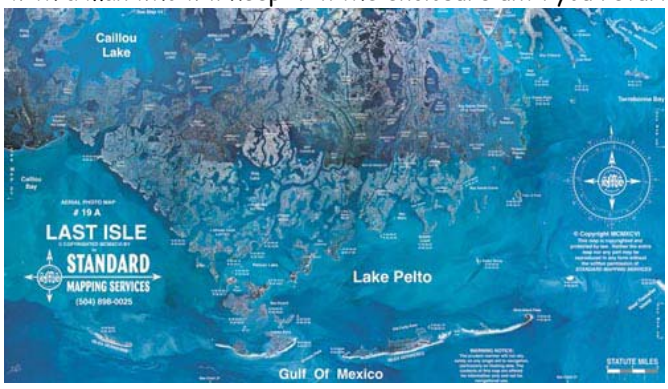
You begin at Dulac, taking with you a fishing pole and a supply of fresh water. Your horse makes his way between tall palmettos, and in places it is hard to push between the huge fan-shaped leaves. Old, sturdy live oak trees shade the way, their massive branches hanging low over the bayou. Thickets of marsh cane grow close to the bayou in places. Further away from the ridge along which you journey, huge old cypress trees tower. They are at least 1,000 years old. You've recently heard talk in town that a new lumber company plans to harvest this timber to build houses and businesses in Houma.

After a while you stop to fish, watching a great egret that is doing the same thing. You catch a nice fish and after cooking the fish on a small fire and eating it, you continue on your way. All around there is wildlife and signs of wildlife. Several marsh deer dart into the trees. You see the marks left by a bear. Muskrat and mink scurry out of your way. You see a family of otters playing in the bayou. The trees are alive with birds of all kinds.

You travel for several hours until you come to a bayou that meets Bayou Sale and blocks your path. You encourage your horse to wade chest deep across the narrow waterway. Once on the other side, you realize how tired you are. The noon sun is beating down, so you stop to rest. You fall asleep with your back against a trunk of an oak. Later, refreshed, you continue along the bayou.

You notice several changes. There are fewer trees, and you can now see far across the open marsh a great expanse of green grass. The birds are also different – now you see spoonbills, rails and other marsh birds feeding in the water. A little later you begin to spot terns, gulls and frigate birds flying overhead. You continue to follow the tree-lined ridge as the sounds, the smells and the sights change, telling you that you are nearing the Gulf of Mexico and the barrier islands.

As evening draws near, you arrive at a shack, nearby is an enclosure for horses. You leave your horse with a man who will keep it in the enclosure until you return from the island. Two mean operate a ferry pulled by ropes that takes you across the narrow body of water separating the Isle Dernieres from the mainland. At last you are on the island! Time to catch supper and sleep. Tomorrow you will explore the sandy beach, watch the pelicans and their young, and look for the remains of the old village and hotel destroyed by the great storm your grand-pére told you about. Perhaps you will find buried treasure left by Pirate Jean Lafitte, who lived here years ago!



READING NOTE: When you read the text, use your normal voice. Read the text slowly and clearly, pausing at appropriate spots to allow listeners to develop the images in the story.

Habitat

Activity 1-17

The Great Marsh Dilemma

Adapted from BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*

Focus/Overview

This role play helps students understand the many sides to the problem of wetland loss in Louisiana.

Learning Objectives

The learner will…

- take roles of members of the community who have an interest in the future of a large tract of marsh land and meet to make their recommendations.
- take roles of parish police jurors charged with the task of developing a management plan for the land.
- solve the problem of a lawsuit brought against the police jury by a party dissatisfied with the management plan.

Louisiana Grade Level Expectations (Science)

7: GLE-38	Analyze the consequences of human activities on ecosystems (SE-M-A4).
HS Biol: GLE-27	Analyze the positive and negative effects of human actions on ecosystems (SE-H-D4) (SE-H-A7).
HS Env. Sci: GLE-22	Analyze the risk-benefit ratio for selected environmental situations (SE-H-C4).

Materials List

- Role play cards (laminated, if possible)
- Props for police jury debate – students can choose a simple prop to represent their profession or occupation
- Props for courtroom scene
- Flip chart, easel, markers or chalkboard

BTNEP Connection
Habitat

Grade Level
7, HS Biol, HS Env. Sci

Duration
2-3 class periods

Subject Area
science

Setting
classroom

Vocabulary
none

Original Source
"Culminating Activity: The Great Marsh Dilemma" in BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*, Activity 11.

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

Advance Preparation

1. Run off and laminate the role play cards.
2. Collect props for police jury debate and courtroom scene.
3. Familiarize yourself with Robert's Rules of Order for the police jury meeting.
4. Contact a person to serve a subpoena (police officer, judge, principal, etc.)

Background

The activity has three parts. In the first part each student receives a role card describing the position of a community member who will make a position statement at a public meeting. After preparing their statements, the students role play a town meeting at which they take turns to make statements. Each speaker's recommendations are recorded on a flip chart and allowed and prohibited uses are listed as the meeting progresses.

In the next phase of the activity, the students assume the roles of police jury members (they are no longer playing the special interest roles of the first part of the activity). A mock police jury meeting is held with the teacher or leader as chairperson. At this meeting, the police jury members' charge is to develop a management plan for the marsh area using the citizens' recommendations and the list of allowed and

prohibited uses developed during the first meeting. The main uses are discussed and a plan written. This plan is displayed in the classroom. At this point, the teacher discusses why certain uses were allowed or prohibited and the potential biases that were evident. The idea that, in some cases, compromise is necessary can be discussed, too. The ideas of sustainability and mitigation are central to this discussion.

In the last phase of the activity, a surprise visitor serves the entire police jury with subpoenas to appear in the court to defend their decisions in a suit filed by a party whose special interests were not met in the management plan. Finally, a court scene is acted out. Students are called upon to testify in their original roles of citizens with special interests in the future of the land. To conclude the court scene, the judge, played by the teacher or leader) must decide who has the most convincing arguments: those in favor of plaintiff's suit or those against.

This activity plays out differently with each group of students. The important lesson is that resolving a dilemma such as this one within a community is very complex. During the police jury meeting, individual biases will play a large part; this will be recognized. The students should see how a balance or compromise is often the final outcome, with consideration being given to retaining the functions and values of the wetland while allowing some uses that will economically benefit the parish.

Procedure

1. *Read the introductory paragraphs (below) to the students. Embellish the story and explain the situation in any way you wish to help your students grasp the central dilemma.*

> We are members of a coastal community that has recently lost a well-respected friend, Mrs. LaTerre. The LaTerre family has lived in this parish since 1780, when it obtained a Spanish land grant. Although the family was once prominent, Mrs. LaTerre was the last remaining survivor. She loved the parish and the land.
>
> Mrs. LaTerre has bequeathed an 80,000-acre tract of marsh land to a Louisiana coastal parish upon her death. Members of the community are now at odds about how the land should be used. The police jury of the parish has been given the task of deciding the future of the valuable piece of property. Mrs. LaTerre made no stipulations in her will about the land, other than the land should be used to "benefit the residents of the parish." The interpretation of this phrase is what has created the dilemma. Some members of the community and police jury consider the word "benefit" in economic terms only; others disagree with that interpretation, contending that the aesthetic quality of the land must be preserved. Some advocate a complete "hands off" approach in which the land should be made into a wildlife refuge with limited access by residents. A nonprofit organization has shown an interest in purchasing the land from the parish to set it aside for conservation and education purposes only.
>
> The land itself is made up of mostly pristine intermediate marsh habitat, with some freshwater marsh and swamp on the inland side, and some brackish and salt marsh closer to the Gulf of Mexico. It is home to incredible populations of wildlife and acts as a nursery for many seafood species. This coastal parish depends heavily on commercial fishery landings for its income, as well as the presence of many recreational fishers who visit and spend money in stores and at other local businesses. Members of the community are aware of the relationship between healthy marshes and productive fisheries.
>
> The land has been in the ownership of the same family since the 1700s. The only development has been several hunting and fishing camps and a few small oil wells owned by the family. There is suspected to be a fairly large reserve of oil beneath the property that has not yet been exploited. An oil company, having heard about the ownership change, is interested in exploration with a view toward producing the oil and gas from the property.

Discuss the concepts involved so the students understand the big picture concerning the land. Consider posting a USGS topographic map of a suitable marsh area on which you have marked out an 80,000-acre area. This will assist students in understanding the size and location of the land.

2. Our job is to work together to decide what should be done with the land. We have many options. Remember, however, that the land is mostly coastal marsh and unsuitable for urban development. As

you think about the dilemma, bear in mind all the things you have learned about the functions and values of wetlands and the problems of coastal land loss and pollution we have discussed.

3. First we will hold a public meeting at which people with special interests in the area may make statements about how they think the land should be developed. Next, we will hold a police jury meeting. All of you will represent members of the parish police jury. We will discuss proposals of the people who spoke at the town meeting. Our job will be to rank the potential uses of the land and develop a management plan for the land.

   Here are 10 role cards. [**Blackline Master #1 – Role Play cards**] If you want to play a role of a special interest group representative, listen to the names as I read them. Raise you had to volunteer to play that role. *Students can play more than one role, as is the case in real life. You can also create additional roles if desired.*

   - Sierra Club, represented by Ms. Scarlet Tanager.
   - Shrimp fisherman's union, represented by Ted Trawl.
   - Oil and Gas Industry Consortium, represented by Mr. R. Evenue, a member of the parish police jury.
   - University researchers, represented by Professor O. Tolith, a marine scientist at Louisiana State University Marine Science Lab.
   - Local concerned citizens, represented by Ms. Lindy Lovetree.
   - Ducks Unlimited, represented by Mr. Merve Ganzer, a local hunting enthusiast.
   - Recreational fishermen, represented by Mr. Red Drum.
   - Parish Economic Development Council, represented by public affairs professional with expertise in ecotourism, Ms. Misty Waters
   - Archeologist, represented by Ms. Betsy Diggs, who is particularly concerned about the cultural history of the area.
   - Businessman and land developer, Mr. Q. Buck.

   Allow students time to familiarize themselves with their roles as explained on the role cards.

4. *Conduct a town meeting, with yourself as chairperson, at which the students assume their roles and state their opinions on the appropriate use of the land. Record the citizens' recommendations about use of the land on a flip chart or chalk board. After the positions have been stated, have the students create a list of allowed and prohibited uses and record them on the flip chart.*

5. Now we will hold a police jury meeting to discuss the proposals made at the previous meeting and to develop a management plan for the land. *Hold a parish police jury meeting to develop the management plan for the land. Follow Robert's Rules of Order throughout the meeting.*

   Presiding over the police jury meeting is Poll E. Ticker (me). I call this meeting of the Parish Police Jury to order. We will follow Robert's Rules of Order throughout the meeting. Each of you is a member of the parish police jury and you have the right to state your opinion - provided you address the chairperson (me) correctly first.

   We will begin with the list of allowed and prohibited uses from our previous meeting. First we will rank the listed uses by taking a vote on each one. You will vote for the proposed land use will indicate that you support the proposed use of the land. The number of votes determines the rank of the proposed land use. We will use this ranked list to write our management plan for the LaTerre land.

6. *After the management plan has been developed, have someone (a local policeperson, judge, the principal, etc.) enter the classroom to serve the police jury members with subpoenas stating that they are being sued by whichever special interest group feels it did not get due consideration during the final police jury vote. [Inform your visitor about particulars of the disgruntled group. You can even prepare simulated subpoenas for the person to hand out to the class.]*

7. *Hold a mock court case with roles of judge, plaintiff's lawyer, defense lawyer and witnesses from the council meeting, including all those who wish to speak. After all the testimony is heard, the judge can make a ruling or the class can serve as a jury to vote on a decision. Again, the teacher or leader may wish to play the role of judge to ensure the role-playing stays on track.*

Blackline Master

1. **Marsh Dilemma Role Play Cards**

Assessment

- Write a short summary of how the public must work together to solve wetland issues.

Resources

BTNEP Resource:

Portrait of an Estuary, publication by LSU AG and BTNEP

Websites:

Rules Online website, no date, **Robert's Rules of Order Revised, by General Henry M. Robert, 1915 4th Ed., Public Domain**, accessed July 8, 2005 at http://www.rulesonline.com/.

Online reference for Robert's Rules of Order.

Holmstrom, Laurel, Sonoma State University, May 13, 2003, **Robert's Rules of Order Made Simple**, accessed July 8, 2005 at http://www.sonoma.edu/Senate/Roberts_Simple.html.

Summary of Robert's Rules of Order.

References:

Sylvester, Nancy. 2004. **The Complete Idiot's Guide to Robert's Rules**. Penguin Group (USA), 352 pp. ISBN: 1592571638.

A book on Robert's Rules that is loaded with understandable and easy to read information.

Jennings, C. Alan. 2004. **Robert's Rules for Dummies** (Dummies Series). Wiley, John & Sons, Inc., 338 pp. ISBN: 0764575740

A book on Robert's Rules that walks readers through assembling a quorum, the order of agenda, the steps for making a motion, nominating and electing officers, and becoming involved in committees.

Blackline Master #1

Marsh Dilemma Role Play cards

Ms. Scarlet Tanager

Sierra Club

We feel truly pristine natural areas are becoming dangerously scarce, jeopardizing the biodiversity of the nation as well as our beautiful state. This has implications for many user groups – the fishermen, hunters, wildlife enthusiasts, scientists, as well as the general public who benefit from sharing their world with nature. This area is one of the last undisturbed wilderness areas of our state. It is home to hundreds of species of birds: migratory water fowl, wading birds, pelicans, egrets and bald eagles. We also believe the parish has a wonderful opportunity in the form of this generous gift of the LaTerre family to contribute to the future of Louisiana. We feel this land should be set aside as a wildlife preserve, managed for the benefit of the wildlife, not for people and financial gain. If we allow oil and gas interests or other commercial developments encroach on this land we will lose an opportunity to save an ecosystem that cannot be replaced.

Dr. O. Tolith

Louisiana State University Marine Lab

At our research and teaching facility we have discussed the need for access to pristine wetland environments. There are few truly undisturbed sites that can be used as control sites for our research on the effects of pollution on the wetlands. We would like to find a site where students could learn about wetland ecology and do field work. The LaTerre land would solve our problem if we could have access to it. Ideally we would like to acquire a small portion to build a field laboratory and dormitories. This would cause limited disturbance to the wetlands. As for large-scale commercial or industrial development on this land, we feel it would do irreparable harm to this unique ecosystem. Therefore, we urge the council not to accept the offers of the oil and gas industry in spite of the economic temptation.

Mr. Ted Trawl

Shrimpers United

My family has been in the shrimping business here for generations. We have seen many changes over the years. When a marsh is affected by erosion or development, the shrimp lose their habitat for the juveniles to grow and mature. If we lose more marsh in this parish, my shrimping business will not survive. Think about the economic impact of all the shrimping in this parish. If we were to lose the shrimp, we would lose a lot. If you like shrimp, you should be for preserving the marsh.

Ms. Lindy Lovetree

School teacher, concerned citizen

I have lived here all of my life and, being a teacher and a mother, my concern is for the next generation. Although I agree that children need opportunities and the community would benefit from economic improvements, let's keep all this in perspective. I cannot see destroying this unique and beautiful place in the name of progress alone. I share Dr. Tolith's views about the educational value of these wetlands, but I feel we must also preserve them because of the ways in which they affect the quality of all of our lives here. To develop the LaTerre land would take away the natural beauty that is so easy to take for granted. I believe we should keep the land in its present state and allow the citizens of our parish and visitors to enjoy the waterways for fishing and bird watching. And let's not forget the values provided the wetlands in terms of flood protection and as a buffer against hurricane damage and as a filter for the pollutants our everyday lives produce.

Mr. R. Evenue

Louisiana Oil and Gas Consortium

Our recent seismic survey showed large reserves of oil and gas beneath the land that this parish now owns. The economic benefits to be gained by the parish from extracting these mineral resources are incredible. The parish is suffering from economic depression and could certainly use these revenues. Visualize new schools for the children of the parish with computers in every classroom and modern teaching equipment, new businesses providing many new jobs for the people of this parish, helping to keep families together. We all use energy – and lots of it. We use it in our cars, boats and in our homes. We need the energy here and throughout the United States. The only wise choice is to develop the potential oil and gas reserves on the LaTerre land. To choose otherwise would be robbing your children of their future in the parish. Today oil and gas extraction can be done with minimal environmental impact. When properly done, we can have the energy and the jobs and protect the environment, too.

Mr. Merve Ganzer

Ducks Unlimited

I represent Ducks Unlimited. We are a national organization concerned with maintaining adequate habitat for water fowl of all kinds. If we fail to protect wildfowl habitats, we will see a decline in duck populations nationwide. The LaTerre land is prime habitat for the ducks and geese that migrate to Louisiana from the north each winter to feed. If this marsh is developed, we will destroy the duck habitat and will have lost an opportunity to develop the potential of this land for duck hunting. Duck hunters can contribute huge amounts to the economy of this parish if you provide access for them during hunting season. I advocate the acquisition of at least 75% of the LaTerre land by Ducks Unlimited for waterfowl protection and hunting. We discourage any development that would alter the hydrology of the land as well as development for oil and gas extraction. We also discourage drainage of marsh waters for construction of any kind.

Mr. Red Drum

Recreational fisherman

Fishing is a big industry here in Louisiana. The recreational fisherman contributes millions of dollars annually to the economy of the state. The LaTerre wetlands, which the parish now owns, are literally a gold mine in terms of fish and the potential for economic gain from encouraging recreational fishing in the area. I see a marina with accommodations for visitors and docks for their boats. I picture big events bringing thousands of visitors here – like the fishing rodeos on Grand Isle. Hotels, restaurants, campgrounds – all of these will benefit if you draw recreational fishermen here. At the same time, you will not need to spoil the beauty of the wetlands themselves. In fact, the more they are left as they are, the better the fishing will be.

Mr. Q. Buck

Businessman

I own a construction business. Buck's Construction is located in this parish and to stay in business and make money, we need to be building things. We can build anything, but the contract has to be there. I can hire the young men of this parish in well-paying jobs once we get the contracts. Real economic development is not in little "warm and fuzzy" projects. We need BIG projects – multi-million dollar projects! We need to extract the minerals that lie beneath the LaTerre marsh or we are cheating ourselves out of a livelihood and schools, stores, shopping malls, big houses, new cars – you name it – we can have it if we are smart. We need to allow the oil industry in to do business in our parish or we will be poor forever.

Ms. Misty Waters

Parish Economic Development Office

We must be realistic. Our parish does not have a sound economic base. We need to proceed carefully and develop the potential of this parish for attracting visitors from far and wide. We have alligators and mysterious swamps. We cook the most delicious food in the nation! We just need to provide good opportunities for tourists and they will come – ready to spend money in our parish! For the LaTerre land, I see a crucial role in strengthening our standing in the tourism industry. We just need to attract investors who are willing to build quality accommodations. Local people will find work as swamp tour guides. We can market the romance of our swamps! Although oil and gas development would bring revenues and business to our parish, do we really want to see ugly oil field equipment trucks rumbling through our town and barges on our waterways? Or do we want to see people enjoying the beauty of our unspoiled wilderness and coming from far and wide to observe the migration of neotropical birds?

Ms. Betsy Diggs

Archeologist

I am just horrified by some of the things I have heard today. I guess none of you has heard of Section 404 of the Clean Water Act. Not one person has mentioned that wetlands can not be developed in any way we please. Before any project involving alteration of a wetland can begin, a permit process must be followed. If the people of the parish have any concern at all for the LaTerre land and the wonderful family who left it to the parish, they will make certain that a full environmental impact statement is conducted before any permits are issued. My job involves documenting past human activities in places that may be altered. I know that this land has Native American burial mounds and shell middens where villages once stood. We should learn about the people who once lived on the land we now claim as ours. We must show respect to them in deciding the fate of the LaTerre land. I urge this council to be cautious in their decisions and not let promises of big shiny cars and beautiful shopping malls blind you.

Changes in Living Resources

Activity 2-1

The Story of a Blue Crab

Focus/Overview
This is an activity focusing on the life cycle of blue crabs. Blackline masters provide students background information, a sheet to indicate where the life cycle of the blue crab takes place within the estuary and the sheet to indicate how to distinguish between male and female blue crabs.

Learning Objectives
The learner will…
- locate the places in the estuary where the blue crab spends portions of its life cycle.
- distinguish between male and female blue crabs.

Louisiana Science Grade Level Expectations

2: GLE-33	Compare the life cycles of selected organisms (e.g., mealworm, caterpillar, tadpole) (LS-E-B1).
2: GLE-34	Describe inherited characteristics of living things (LS-E-B3).

Materials List
- one copy of Blackline Master 1 (overhead, if possible).
- class copies of the Blackline Masters 2-4.
- ***The Blue Crab: "Beautiful Swimmer"*** poster (LA Sea Grant, optional)
- enlargement of the stages of a blue crab life cycle (from **Blackline Master #3**) and the names of the stage printed on separate cards.

Background Information
The mating season for blue crabs is spring through fall. The female blue crab mates in the estuary waters of coastal Louisiana after her last molt while her shell is still soft. She then swims into the nearshore waters of the Gulf of Mexico where she spawns, or releases, her **eggs**. While the female blue crab mates only once in her life time, she has enough sperm to spawn several times, releasing eight to nine million eggs total. Until the eggs hatch, the female blue crab carries them around in a sticky mass attached to her swimmerets, which are feathery appendages, found in pairs on her abdomen.

Newly hatched larva, called **zoea**, look like tiny dark specks in the water. They start out life in the Gulf of Mexico waters, and eventually are carried inshore by wind currents. By the time the tiny larvae reach the protected waters of the **estuary** marshes, "nursery" areas where they continue to feed and mature, they have molted several times and have reached the **megalops larvae** stage. Megalops have claws and can swim and crawl along the bottom, but are less than ¼" in length. Megalops continue to grow and mature in the protected estuary waters where they stay for almost a year, eventually reaching the **juvenile** or **immature stage**. Larger organisms eat many zoea, larvae and megalops. When the juveniles reach adulthood, mating takes place in the protected estuary waters. The female returns offshore to the waters of the Gulf of Mexico to spawn, while the male remains in the protection of the estuary.

[*This background information modified from The Blue Crab: "Beautiful Swimmer" poster (Louisiana Sea Grant College Program).*]

BTNEP Connection
Changes in Living Resources

Grade Level
2

Duration
2 30 minute sessions

Subject Area
science

Setting
classroom

Extension Areas
language arts, science, arts

Vocabulary
estuary, egg, zoea larva, megalops larva, immature blue crab

Original Source
Idea by V. Butler's Writing Team, from BTNEP *Salt Marsh Habitat Activity Book*, p. 4-6.

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www.btnep.org

Advance Preparation

1. Run off a color copy of Clawdette (**Blackline Master #1**) and class copies of **Blackline Masters #2-4**.

Procedure

1. Show students the colored copy of Clawdette (**Blackline Master #1**). Ask students to tell you what they know about Clawdette. (She is a blue crab; lives in coastal waters, has pinchers, etc.) What are some things that students would like to know about Blue Crabs? List these on the board.
2. Read the **Cranky Blue Crab: A Tale in Verse**. Have students describe the habitat where the blue crab lives.
3. Paraphrase or have students read aloud Clawdette's "The Story of My Life." (**Blackline Master #2**). Discuss the story. Point out where the story takes place on the *Life Cycle of a Blue Crab* poster (LA Sea Grant College Program, see Resource list) or map of the Barataria-Terrebonne National Estuary.
4. Discuss each stage of the blue crab's life cycle with the students as you display the vocabulary word and a picture of each life cycle. In your opinion, when do the baby blue crabs start to look like their parents? *(Megalops stage – they have claws and can swim or crawl along the bottom)* (Draw or enlarge copies from **Blackline Master #3**).
5. Remove either the vocabulary words or the pictures of the life cycle and have student volunteers try to match the pictures to the vocabulary.
6. Pass out "Clawdette's Life Stages" (**Blackline Master #3**) and have students place the different stages of Clawdette's life in the locations where they take place within the **estuary**. Explain that an estuary is a special place on the coast where river and bayou waters meet the Gulf of Mexico. Explain that Clawdette is an animal that lives in many different places within the estuary during her lifetime.

Blackline Masters

1. **Clawdette**
2. **The Story of My Life**
3. **Clawdette's Life Stages**
4. **Shelby's Habitat**

Assessment

- Ticket Out the Door – have students name one thing they have learned about the blue crab.
- Evaluate Clawdette's Life Stages (Blackline Master #3) to see if students have placed the blue crab life stages in the correct locations.

Extensions

Language Arts:

Choose one of the tradebooks listed in the RESOURCES section to read to your students. Have them draw a picture of a blue crab and list two things they know about blue crabs.

Write a story about the life of a blue crab. Write a description about how male and female blue crabs are different.

Science:

Have students read and color Shelby's Habitat (Blackline Master #4). Students should be able to identify the difference between male and female blue crabs (Blue pinchers belong to males, red pinchers belong to females.)

Read **A House for Hermit Crab** by Eric Carle. Obtain a hermit crab from a pet store. Discuss the characteristics of hermit crabs. Have students compare and contrast a blue crab with a hermit crab.

Arts:

Using various media, have students create images of blue crabs.

Resources

BTNEP Resources
Somers, Rachel. 2001. **Salt Marsh Habitat Activity Book**. Barataria-Terrebonne National Estuary Program.

POSTERS
Life Cycle of the Blue Crab [poster]. Available free from Louisiana Sea Grant College Program, LSU Sea Grant Building, Baton Rouge, LA 70803. Call to order one at 225/ 578-6448.

REFERENCE BOOKS (ADULT LEVEL)
Robert, Russell. 2002. **All About Blue Crabs and How to Catch Them**. Centennial Publications.
A book about where to find blue crabs, how to catch crabs, how to cook crabs, the life cycle of and mythology of crabs. Adult.

TRADEBOOKS
Carle, Eric. 2002. **A House for Hermit Crab.** Aladdin Paperbacks.
This is a story about a hermit crab that is trying to decorate his home. Once he is finished and is ready to move into his new home, he discovers to his dismay, that he has already outgrown the new home. Reading level: Ages 4-8.

Childress, Mark. 1996. **Joshua and the Big Bad Blue Crabs.** Little Brown and Company.
An illustrated picture book about a young boy named Joshua who is trying to deliver a huckleberry pie to his grandmother when a mob of blue crabs steals the pie. Reading level: Ages 4-8.

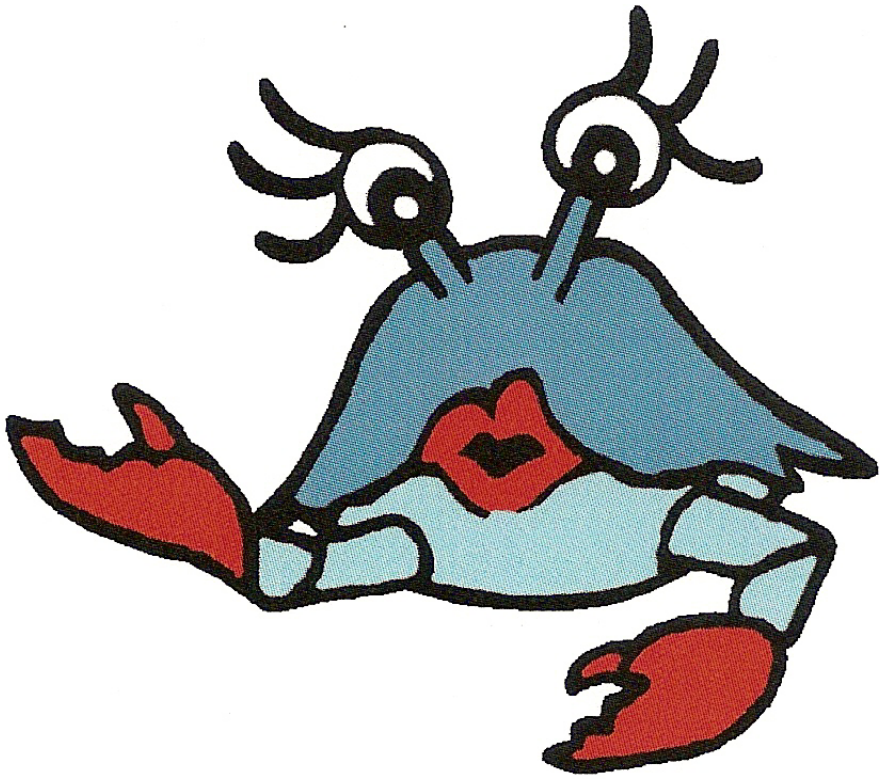
Hollenbeck, Kathleen. 1999. **Dancing on the Sand: A Story of an Atlantic Blue Crab.** Soundprints Corp Audio.
An illustrated picture book on the blue crabs of Chesapeake Bay. The text gives information on the mating and molting and how crabs avoid predators. Reading level: Ages 4-8.

Hollenbeck, Kathleen. 2001. **The Blue Crab's Dance.** McGraw-Hill Children's Publishing.
An illustrated picture book on the blue crabs of Chesapeake Bay. The book tells the story of the blue crab in its natural environment. Accurate in detail and rich in storytelling. Reading level: Ages 4-8.

Kite, Patricia. 1994. **Down in the Sea: The Crab.** Albert Whitman & Co.
A book with great photographs and information about ocean life. Reading level: Ages 4-8.

Watkins, Dawn L.. 2000. **The Cranky Blue Crab: A Tale in Verse.** Bob Jones University Press.
An illustrated picture book about a young crab named Crusty the Crab. He exclaims, "I'm bored with this place/ And its limited range./ I think I'll live out/ On the land for a change." Restless and unhappy, he leaves his seaside home under Jaggedy Ledge to look for an adventure. Reading level: Ages 4-8.

Blackline Master #1



Clawdette

The Official Mascot of the Barataria-Terrebonne National Estuary Program

Blackline Master #2

The Story of My Life

by Clawdette

My name is Clawdette, and I am a female blue crab. I began life as a tiny egg

attached to my mother along with thousands of siblings in the Gulf of Mexico. Then I hatched as a zoea larva.

In the deep water, there was plenty of food to eat, so I grew even bigger. As I continued to grow and became a megalops larva,

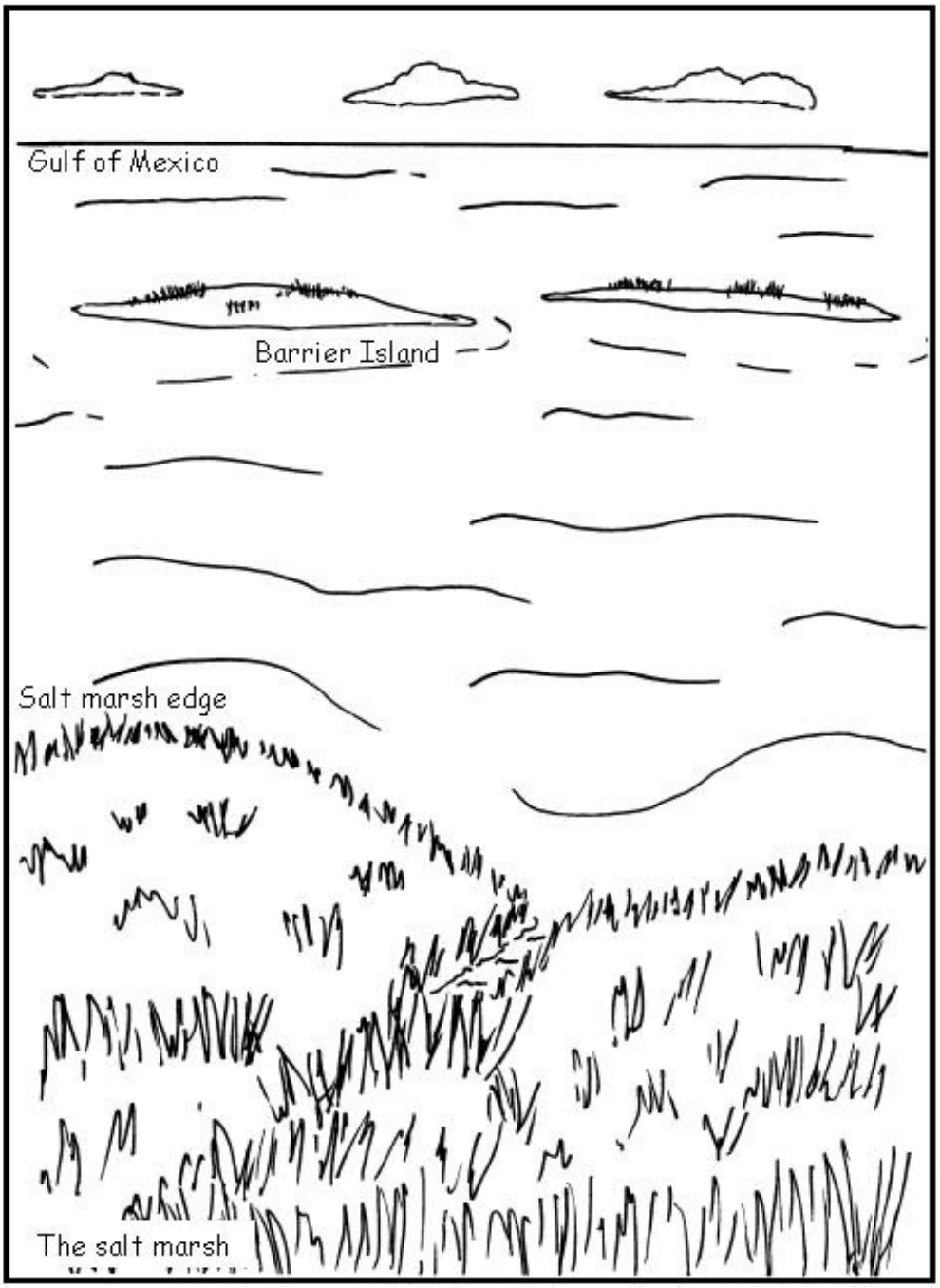
I was strong enough to start to swim inland towards the salt marsh. During my next stage, I became an immature blue crab. As an immature crab,

I swam to the salt marsh edge and found marsh grasses to shelter me from animals that wanted to eat me. Now I am a mature blue crab and live in the salt marsh. In the summer, I will travel to the deep offshore waters to lay my own eggs. Then the cycle will begin again.

Blackline Master #3

Draw a line to show where I lived in each life stage.

Clawdette's life stages



Egg

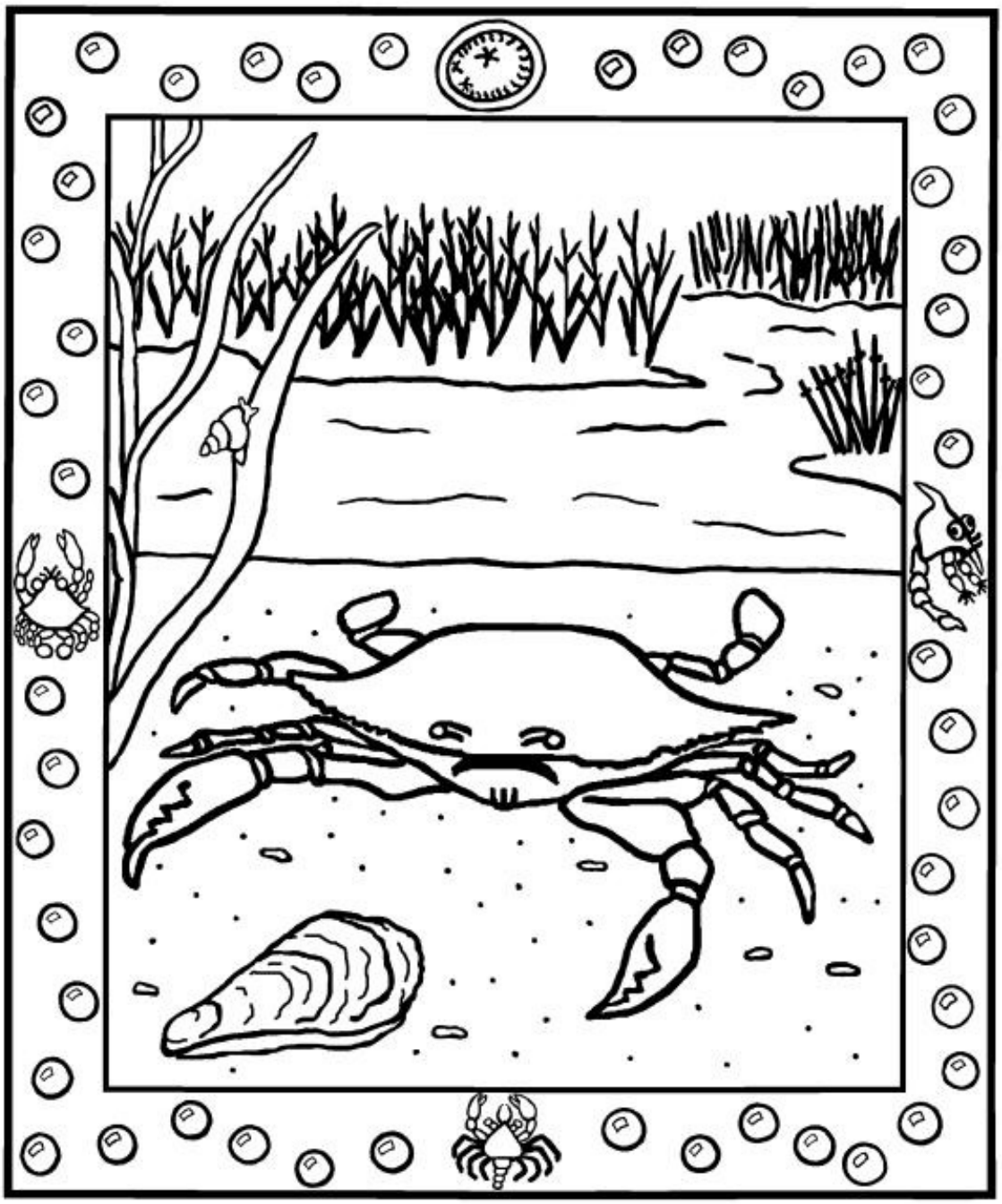
Zoea Larva

Megalops Larva

Immature Blue Crab

Adult Blue Crab

Blackline Master #4



This is my sister, Shelby. Female blue crabs like Shelby and me have red claws. Male blue crabs have blue claws. This is a way to tell the difference between females and males.

Activity 2-2

Understanding Animal Adaptations

Adapted from LA Dept. of Wildlife and Fisheries

Focus/Overview

Students will explore the ways humans and beavers have developed body structures that adapt to their habitats. They will then use props to represent these adaptive beaver features, turning a volunteer student into a beaver.

Learning Objective

The learner will…

- describe the features of a beaver that benefit them in their environment.

Louisiana Grade Level Expectation

1: GLE-32	Describe features of some animals that benefit them in their environments (LS-E-C1).

Materials List

Provide a list of supplies necessary to conduct the activity.

- **Knee Deep in Louisiana Wetlands** CD (see resource list)
- computer
- paddle
- teeth (cut from an index card or a picture of teeth)
- piece of real or fake fur, hide, or brown towel
- swim fins
- oil can
- gloves
- ear plugs
- nose plugs
- goggles
- musk cologne or perfume

Background Information

The beaver is the largest North American rodent and lives in every state and province in the United States and Canada. Its biological name is *Castor canadensis.* American Indians called the beaver the "sacred center' of the land because it ability to change the landscape by damming streams and small rivers enables other wetland mammals, fish, frogs, turtles, ducks and birds to thrive in the newly created wetland habitat.

Beavers live in lodges that they build in rivers and streams from small trees and mud. First the beaver gnaws down trees that fall into the river forming a dam, which floods the upstream portion of the river. Beavers build their home, or lodge, on the top of the dam, with the opening to the home underwater, which helps keep them safe from predators. Beavers are great swimmers and can hold their breath for as long as 12-15 minutes and can swim underwater up to a mile.

Beavers are often confused with another large rodent that is not native to Louisiana, the nutria. Unlike the nutria, beavers have a wide flat tail, which measures 11-15 inches long and 6 inches wide. They use their big tails to propel them through the water when swimming and to warn other beavers of danger by slapping it on the water to raise an alarm. Adults are humped backed and weigh an average of 33 pounds.

BTNEP Connection
Changes in Living Resources

Grade Level
1

Duration
30 minutes

Subject Area
science

Setting
classroom

Extension Areas
math, language arts

Vocabulary
habitat, function, adaptation

Original Source
Modified from LA Dept. of Wildlife and Fisheries "Dress a Fish."

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Beavers have several features besides their tails that help them live in an aquatic habitat. They have webbed feet and special castor glands on their abdomen that produce oil that the beaver rubs onto its fur to waterproof it. Also their ears and nose have special muscles that allow them to close these openings when underwater.

LA Fur and Alligator Advisory Council

Beavers mate for life during their third year. Both parents care for the baby beavers, called 'kits', which are usually born in the spring. There can be anywhere from one to four kits in a litter. The kits normally stay with their parents for two years, and yearlings act as babysitters for the new litter.

Beavers can live for as long as 19 years and can get as long as 3 to 4 feet. During their lifetime, beavers are strict vegetarians, eating on the outer layers of many woody trees, such as sweetgum, yellow poplar, and willow.

In Louisiana, beavers are trapped for their fur, which is part of a fur industry that produces more than 1.3 million pelts a year from nutria, muskrat, mink, otter and beaver.

Advance Preparation

1. Assemble pictures of animals (including humans and beavers) and plants that have adapted to their habitat. Include video clips, animated clips from CD's (see Knee Deep in Louisiana Wetlands CD).
2. Assemble prop materials. See **Blackline Master #1** for a list of prop items and the part of beaver each represents, and functions.

Procedure

1. Show students pictures of humans involved in daily activities.
2. Lead a discussion of structures on humans which help or protect them while they perform these activities. Examples include (1) writing – fingers and thumbs; (2) playing in the sun – hair; and (3) chewing food – teeth.
3. Show pictures of animals and where they live, including beavers. Show any animated clips or videos available. What kinds of things do beavers do during the day? *(Swim, eat, sleep, dive and swim underwater, etc.)* Prompt a discussion of the features (body structures) that beavers have that make these types of behavior possible. Do beavers have any special body parts that help them do these activities? What are they?
6. Explain that this is called **adaptation**. Discuss with the students the definition of an adaptation and how it is useful to a plant or animal. Explain to the students that an organism may have many different adaptations and that this activity is designed to show them the varying adaptations of an aquatic mammal - the beaver.
7. Ask for a student volunteer from the group and tell them that, with the group's help, you are going to turn the student into a beaver by dressing the volunteer with props representing all the adaptations that a beaver possesses. Who give me an adaptation that the beaver has that enables it to survive its aquatic environment? (See **Blackline Master #1** for guidance). As the students come up with the different adaptations, add the appropriate props, one at a time, to the student. Make sure to take time to explain the uses of each adaptation to the group and how it helps the beaver survive. The props can be put on the volunteer in any order and leading questions can be asked to help the group come up with all of the adaptations.

Blackline Master

1. **Animal Adaptations**

Assessment

- Put the Dress a Beaver props in a large pillowcase or bag and have students draw a prop out at random and tell what adaptation it refers to on the beaver.

Extensions

Mathematics/Language Arts:

Read **Twelve Snails and One Lizard** (see Resource List below) and have students find other nontraditional tools they could use to measure 36 inches.

Resources

Tradebooks:

George, Lindsey Barrett. 2000. **Beaver at Long Pond.** Simon and Schuster.
A beautifully illustrated book about a beaver's nighttime work. Reading level: Ages Baby - K.

Hightower, Susan. 1997. **Twelve Snails and One Lizard.** Simon and Schuster.
A math lesson (inches, feet, and yards) in story form.. This story is about Milo the Beaver who needs to cut a branch exactly 36 inches long to bridge a gap in his dam before the pond goes dry. Reading level: Ages 4-8.

McDonald, Amy. 1998. **Little Beaver and the Echo.** Puffin.
A beautifully illustrated book with detailed and colorful pictures. This story is about a young beaver who is searching for someone across the lake, that ends up being his echo. On the way he meets a variety of friends: a duck, an otter, and a turtle. Reading level: Ages 4-8.

Websites:

Beavers: Wetlands & Wildlife. 2002. **The Beaver (*Castor canadensis*)** accessed on June 2, 2004, from http://www.beaversww.org/beaver.html.

References

Gateway New Orleans. 2002. **Facts About Louisiana**, accessed 06/03/04 at http://gatewayno.com/history/Facts.html.

Louisiana Fur and Alligator Advisory Council, n.d., **Beaver: *Castor canadensis***. Accessed on June 3, 2004, from http://www.alligatorfur.com/biology/beaver.htm.

Blackline Master #1

Animal Adaptations

Item	Represents this beaver part	Functions
canoe paddle (handle may need to be cut off)	tail	• The tail helps the beaver maneuver while swimming (propeller to push it through the water and rudder to steer). • Beavers warn other beavers of possible danger by slapping it on the surface of the water. • Beavers store fat in their tails for times when the food supply isn't abundant. • Beavers use their tails as a stool (for support) when sitting up to gnaw on trees.
teeth cut from an index card.	teeth	• The beaver's teeth help the beaver obtain the wood materials that they need to eat (cambium trees) and build their lodges and dams. • The teeth of a beaver are unique. They grow at an enormous rate (as much as three inches a month). • Beaver's front teeth grow continuously, keeping pace with the constant wear from gnawing wood. The teeth stick out past beaver's lips so it can gnaw, chew, and swallow underwater without choking.
deer hide, fur, or brown towel	fur	• The fur of a beaver helps keep the animal warm. • Inner fur, or undercoat, is thick, soft, and fuzzy and used to trap air to keep the body warm. • The outer fur consists of tough guard hairs used to shed water - much like a raincoat. • The beaver has a built-in radiator, a special kind of circulation that brings heat to their legs and feet, which are often wet and exposed to the cold. • The brown coloration of beaver fur provides protective camouflage when out of water. • The beaver was once an endangered species in Western North America due to extensive trapping for the sale of furs.
oil can (quart of oil)	oil gland	• The oil from the oil gland helps to keep the beaver dry even when swimming.
swimming fins or flippers	back feet	• Webbed hind feet of the beaver enhance the swimming ability of this mammal by providing propulsion through the water. • The second nail on each foot has a split nail that is used for grooming.
gloves	front paws	• The front paws of the beaver are able to grasp materials much like human thumbs. • The beaver's front paws are used for digging, working on dams and building their lodges, as well as gripping their food.
ear plugs	special muscles in the beaver's ear canals	• Special muscles in the beaver's ears enable them to close their ear openings completely so no water to enter ears when under water. • Beavers can stay under water up to fifteen minutes.
nose plugs	special muscles in the beaver's nose	• Special muscles in the beaver's nose enable them to close their nose openings completely so that no water is able to enter while they are submerged. • Beavers can stay under water up to fifteen minutes.
swimming goggles	clear third eyelid	• Beavers have a clear third eyelid, 'nictitating membrane', which covers and protects their eyes.
musk cologne or perfume	musk oil (caster gland)	• Beavers have a special oil gland that they use to mark their territory. • Beaver musk oil has been used to make some perfumes and medicines.

Activity 2-3

The Louisiana Meal

Pam Blanchard

Focus/Overview

Students will discover in this lesson what common foods we eat here in Louisiana depend on renewable natural (and edible) resources - native animals and plants. Using the USDA Food Pyramid as a guide, the students will decide on what native foods they want in their meal, then find recipes that utilize these native plants and animals.

Learning Objectives

The learner will…

- create a meal that includes representatives from each of the five groups on the food pyramid.
- locate at least one recipe that incorporates a native or farmed food from Louisiana.
- explain how seafood and agricultural products are renewable resources and explain how the habitats of these food sources needs to be protected.

Louisiana Grade Level Expectations

3: GLE 60	Explain how renewable and nonrenewable resources can be replenished or depleted (SE-E-A4)
3: GLE 43	Identify a meal that includes representatives from each group of the food pyramid (LS-E-A6)

Materials List

Provide a list of supplies necessary to conduct the activity.

- Blackline Master #1 – copies for each student
- Access to Internet or a variety of

Background Information

We are very fortunate to live in a state that celebrates many of its *renewable edible resources*. One look at the list of Louisiana food festivals (Table 1) shows us just how much we enjoy our food. We celebrate shrimp (Morgan City), crawfish (Breaux Bridge), frogs (Rayne), gumbo (Thibodaux), and ducks (Gueydan) – just to name a few.

Table 1. Louisiana Food Festivals

Alligator (Franklin)	Oyster (Amite)
Andouille (LaPlace)	Pecan (Colfax)
Blueberry (Mansfield)	Pepper (St. Martinville)
Catfish (Washington, Des Allemands, Winnsboro, Melville)	Praline (Houma)
Corn (Bunkie)	Rabbit (Iowa)
Crab (LaCombe)	Rice (Crowley)
Cracklin (Port Barre)	Seafood (Mandeville, Jean Lafitte)
Crawfish (Breaux Bridge, Shreveport, Chalmette)	Shrimp (Morgan City, Delcambre)
Crawfish Étouffée (Eunice)	Soybean (Jonesville)
Duck (Gueydan)	Strawberry (Ponchatoula)
Étouffée (Arnaudville)	Sugarcane (New Iberia, Natchitoches)
Frog (Rayne)	Swine (Basile)
Garfish (Baldwin)	Watermelon (Franklinton)
Gumbo (Thibodaux, Bridge City, Chackbay)	Yams (Opelousas)
Jambalaya (Gonzales, Jeannerette)	

BTNEP Connection
Resources

Grade Level
3

Duration
45-90 minutes

Subject Area
science

Setting
classroom

Extension
science

Vocabulary
food pyramid

Original Source
Lesson created by Pam Blanchard. Concept V. Butler's Writing Team. Lesson created by Pam Blanchard.

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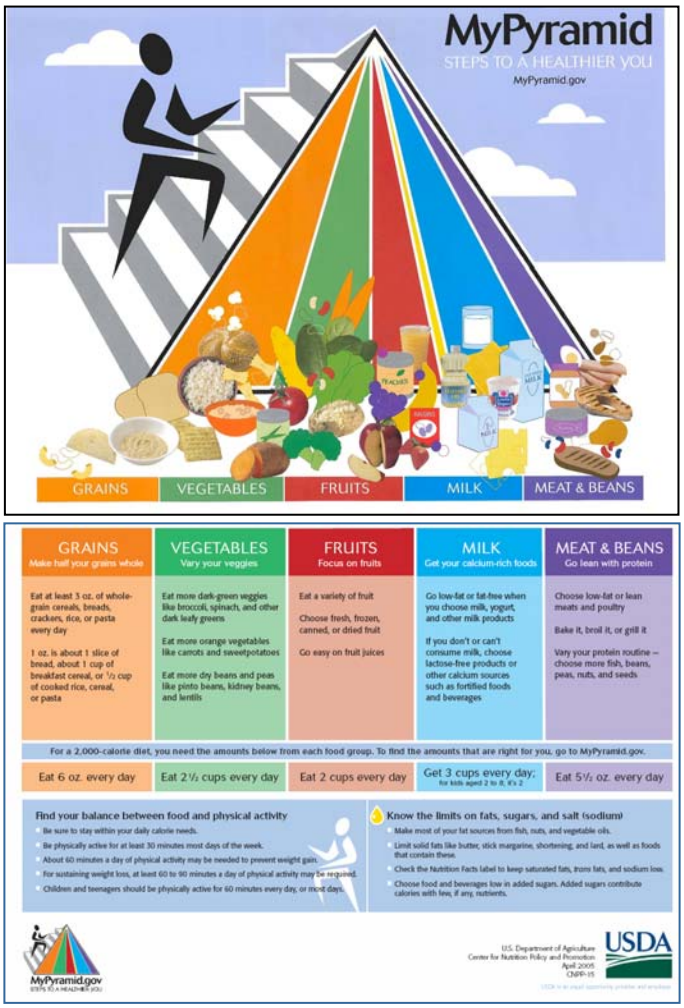
Health conscious Cajuns are aware that they can create dishes that are low fat and healthy using foods that are native to or produced in Louisiana. When planning a meal, it is important to keep in mind the nutritional analysis for the recipe you are making and how that particular recipe fits into the USDA Food Guide Pyramid (2005), which helps people eat a balanced diet from the five major food groups.



USDA Food Pyramid (2005) miniposter.
Downloadable from http://www.mypyramid.gov.

Fortunately, today many cookbooks include the nutritional analysis per serving for the recipes printed in their books.

The Food Guide Pyramid looks at foods from the five major food groups. The five groups are grains, vegetables, fruits, milk, and meat & beans. Each of these food groups provides some, but not all, of the nutrients you need to lead a healthy life. Foods in one group can't replace those in another. No one food group is more important than another - for good health, you need them all in appropriate proportions.

In the newly released food pyramid, the differing widths of the color bands suggest about how much food should be eaten from each group. Foods within a food group can vary in the amounts of solid fats and added sugars they contain. Selecting more foods from the bottom of the bands provides more nutrition from the calories consumed. The bottom, wider portion of each band represents the foods in the most nutrient dense form—that is, containing little or no solid fats and added sugars. The top, narrow end of each band represents foods within the group with more solid fat and added sugars. For example, an apple would be at the bottom of the fruit band, sweetened applesauce higher in the band, and apple pie towards the top.

The steps up the side of the Pyramid and a person actively climbing the steps are included to represent the advice to engage in regular physical activity. Recommendations are for adults to engage in a minimum of 30 minutes of activity each day and for children, 60 minutes most days of the week. The more active a person becomes the more they can eat items from the narrow end of the band. *(This information is taken from the MyPyramid Peer-to-Peer PowerPoint presentation that can be downloaded from the MyPyramid.gov website.)*

Advance Preparation

1. If you don't have a computer lab available at your school, you will need to bring in cookbooks for the students to use in this activity.
2. You will need copies of the activity (**Blackline Master #1**) and the food guide pyramid miniposter (**Blackline Master #2**) – one per student.
3. Copy the Food Festivals of Louisiana table (Table 1) onto the chalk board or prepare an overhead sheet (**Blackline Master #3**).

Procedure

1. Show students a diagram of the USDA's Food Guide Pyramid (**Blackline Master #2**). Do you know what this diagram is? *(That's right. It is a diagram of the kinds of foods we should eat if we want to*

have a healthy, well-balanced diet.) Can anyone tell me why it is in the shape of a triangle? *(The broad bottom level of the triangle means that we should eat more of these foods – the grains. We should eat least amount of things at the top of the food triangle – the sweets.)* What are the five food groups represented in the Food Guide Pyramid? *(grains, vegetables, fruits, meats & beans, milk)*

2. Louisiana produces many of our favorite foods to eat. What are some of your favorite foods to eat? Tell me our favorite food and we'll decide which category of the Food Guide Pyramid it belongs in. *(List these on the blackboard)*
3. Louisiana has many great food festivals. Have you ever been to one of the festivals? How about the Gumbo Festival in Thibodaux? Or the Shrimp and Petroleum Festival in Morgan City? Or the Praline Festival in Houma? (Show students **Blackline Master #3**).
4. Today we are going to create a balanced nutritious meal from plants and animals that are either native to Louisiana or are produced by farmers/ranchers here in Louisiana. You need to create a Cajun Creole meal that includes dishes that contain all five food groups in the Food Guide Pyramid. You should have a main dish, two vegetables, a starch, and a dessert. I've got some websites and cookbooks you can look at to find recipes. Be sure to record where you got your recipe from.

Blackline Masters

1. **Creating a Louisiana Meal**
2. **Food Guide Pyramid**
3. **Food Festivals of Louisiana**

Assessment

- Students should be able to identify the five good groups of the USDA Food Guide Pyramid. They should also be able to locate recipes (using indexes or search engines) for each of the five Louisiana-produced foods.

Extensions

Science:

Choose one of the recipes you found. Write down the number of calories, amount of protein, fat and carbohydrates are in each serving.

Resources

Websites:

KidsHealth, **The Food Guide Pyramid**, accessed June 18, 2004, at http://kidshealth.org/kid/stay_healthy/food/pyramid.html.
A website that explains the new food guide pyramid for kids on their reading level. Each food group is explained and several examples of included foods are given with appropriate serving size.

U.S. Department of Agriculture, n.d. **My Pyramid**, accessed January 9, 2006, at http://www.mypyramid.gov/professionals/index.html
A website that explains the new food guide pyramid in depth. Professional resources, including downloadable miniposter, education notes and PowerPoint presentation.

University of Louisiana at Lafayette's Center for Culture and Eco-tourism, n.d., **Louisiana Festivals/ Fairs/ Activities**, accessed June 18, 2004, http://ccet.louisiana.edu/03a_Cultural_Tourism_Files/01.10_Festivals.html.

Blackline Master #1

The South Louisiana Meal

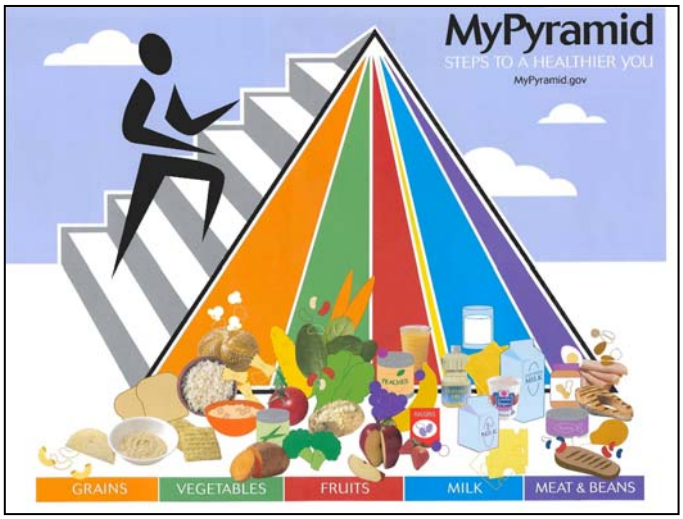
Name _____

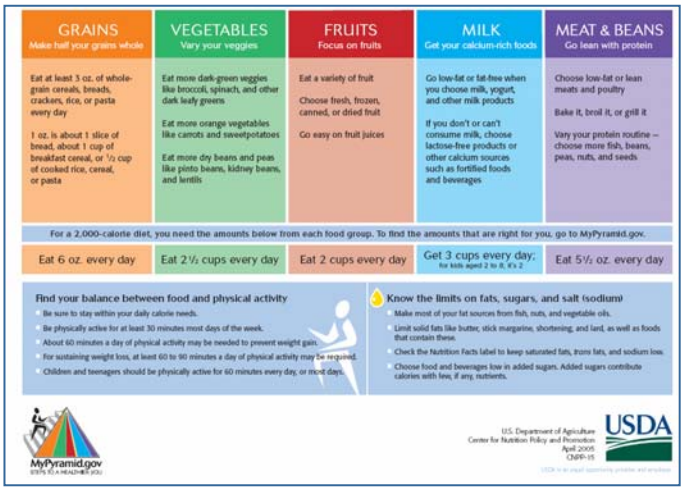
Your task is to create a Louisiana Cajun Creole meal that includes dishes that contain all five food groups in the Food Guide Pyramid. You should have a main dish, two vegetables, a starch, and a dessert. All of these foods must either be native to Louisiana or able to be grown here.

The Food Guide Pyramid was designed as an easy way to show the groups of foods that make up a good balanced diet. It also tells you that you need to eat a variety of foods from all five groups and how much of the foods from the different groups you should eat to stay healthy. Its pyramid shape helps explain which foods you should eat more or less of. The foods that make up the bottom of the pyramid should make up the biggest part of your diet. As you go up the pyramid, the amounts of different foods you need get smaller.

The main dish, vegetables, starch and dessert dishes must have main ingredients that are native to or grown in Louisiana. Complete the chart below with your choices. For each of your choices you will need to locate a recipe you would like to make using your choice of food.

Once you have planned your meal, go to the Internet and search for recipes. You will need to look up recipes for all your dishes. Write the name of the recipe and the book title and page number or website address for each recipe you choose.





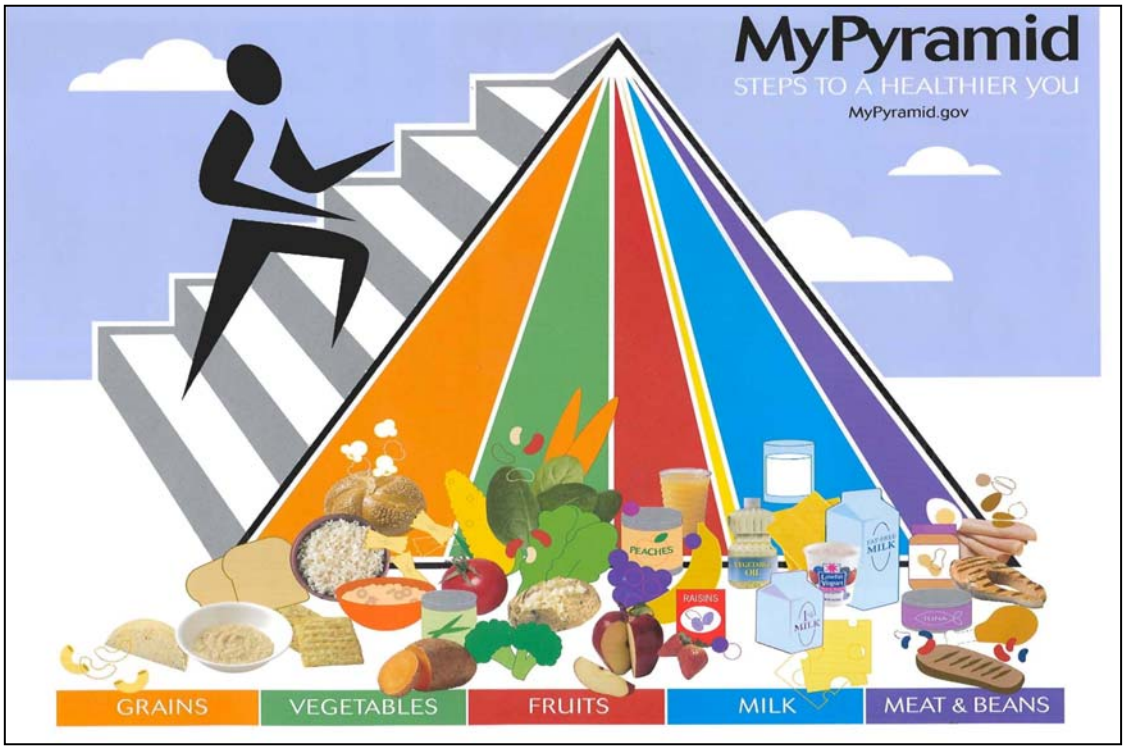
USDA Food Pyramid (2005) miniposter.
Downloadable from http://www.mypyramid.gov.

Dish	Name of Recipe	Recipe Book or Website
Main dish or Protein Source: _____		
Vegetable: _____		
Vegetable: _____		
Starch: _____		
Dessert: _____		

Blackline Master #2

The U.S. Department of Agriculture and U.S. Dept. of Health and Human Services

Food Guide Pyramid



GRAINS Make half your grains whole	VEGETABLES Vary your veggies	FRUITS Focus on fruits	MILK Get your calcium-rich foods	MEAT & BEANS Go lean with protein
Eat at least 3 oz. of whole-grain cereals, breads, crackers, rice, or pasta every day 1 oz. is about 1 slice of bread, about 1 cup of breakfast cereal, or ½ cup of cooked rice, cereal, or pasta	Eat more dark-green veggies like broccoli, spinach, and other dark leafy greens Eat more orange vegetables like carrots and sweetpotatoes Eat more dry beans and peas like pinto beans, kidney beans, and lentils	Eat a variety of fruit Choose fresh, frozen, canned, or dried fruit Go easy on fruit juices	Go low-fat or fat-free when you choose milk, yogurt, and other milk products If you don't or can't consume milk, choose lactose-free products or other calcium sources such as fortified foods and beverages	Choose low-fat or lean meats and poultry Bake it, broil it, or grill it Vary your protein routine – choose more fish, beans, peas, nuts, and seeds
Eat 6 oz. every day	Eat 2½ cups every day	Eat 2 cups every day	Get 3 cups every day; for kids aged 2 to 8, it's 2	Eat 5½ oz. every day

For a 2,000-calorie diet, you need the amounts below from each food group. To find the amounts that are right for you, go to MyPyramid.gov.

Find your balance between food and physical activity

- Be sure to stay within your daily calorie needs.
- Be physically active for at least 30 minutes most days of the week.
- About 60 minutes a day of physical activity may be needed to prevent weight gain.
- For sustaining weight loss, at least 60 to 90 minutes a day of physical activity may be required.
- Children and teenagers should be physically active for 60 minutes every day, or most days.

Know the limits on fats, sugars, and salt (sodium)

- Make most of your fat sources from fish, nuts, and vegetable oils.
- Limit solid fats like butter, stick margarine, shortening, and lard, as well as foods that contain these.
- Check the Nutrition Facts label to keep saturated fats, *trans* fats, and sodium low.
- Choose food and beverages low in added sugars. Added sugars contribute calories with few, if any, nutrients.

MyPyramid.gov
STEPS TO A HEALTHIER YOU

U.S. Department of Agriculture
Center for Nutrition Policy and Promotion
April 2005
CNPP-15

USDA

USDA is an equal opportunity provider and employer.

USDA Food Pyramid (2005) miniposter.
Downloadable from http://www.mypyramid.gov.

Blackline Master #3

Food Festivals of Louisiana

Festival (Location)
Alligator (Franklin)
Andouille (LaPlace)
Blueberry (Mansfield)
Catfish (Washington, Des Allemands, Winnsboro, Melville)
Corn (Bunkie)
Crab (LaCombe)
Cracklin (Port Barre)
Crawfish (Breaux Bridge, Shreveport, Chalmette)
Crawfish Ėtouffėe (Eunice)
Duck (Gueydan)
Ėtouffėe (Arnaudville)
Frog (Rayne)
Garfish (Baldwin)
Gumbo (Thibodaux, Bridge City, Chackbay)
Jambalaya (Gonzales, Jeannerette)
Oyster (Amite)
Pecan (Colfax)
Pepper (St. Martinville)
Praline (Houma)
Rabbit (Iowa)
Rice (Crowley)
Seafood (Mandeville, Jean Lafitte)
Shrimp (Morgan City, Delcambre)
Soybean (Jonesville)
Strawberry (Ponchatoula)
Sugarcane (New Iberia, Natchitoches)
Swine (Basile)
Watermelon (Franklinton)
Yams (Opelousas)

Changes in Living Resources

Activity 2-4

Wetland Webs

Adapted from *Project CEED* and
BTNEP/LSU AgCenter: *Wetland Functions, Values and Economic Resources*

Focus/Overview

This activity can be used to introduce the concept of food web. It can also be used to review the concepts learned.

Learning Objective

The learner will…

- create a physical representation of a wetland food web and identify the importance of each component of the web.

Louisiana Grade Level Expectations (Science)

2: GLE-46	Illustrate and describe a simple food chain located within an ecosystem (SE-E-A2).
4: GLE 71	Describe and explain food chains/webs and the directional flow of energy in various ecosystems (e.g. construct a model, drawing, diagram, graphic organizer) (SE-E-A2).
5: GLE 23	Construct food chains that could be found in ponds, marshes, oceans, forests, or meadows (LS-M-C2).

Materials List

- Large index cards
- Hole punch
- Markers
- List of wetland organisms
- Books about wetland wildlife
- A collection of photographs of wetland wildlife from magazines, etc.
- Five balls of different colored yarn

Background Information

Food webs introduce students to scientific terms like producers, herbivores, omnivores, carnivores, detritivoes and scavengers. Using wetland organisms to create food webs, help students understand their own habitat and how the biotic, or living, factors in an ecosystem are dependent upon one another.

BTNEP Connection
Living Resources

Grade Level
2, 4, 5

Duration
45 minutes

Subject Area
science

Setting
classroom

Extension Areas
art

Vocabulary
producers, herbivores, omnivores, carnivores, scavengers, detritivores

Original Sources
Adapted from *Project CEED* and "Wetland Webs" in BTNEP/LSU AgCenter: *Wetland Functions, Values and Economic Resources*, Activity 4.

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

Procedure

1. One value of wetlands is providing a rich habitat for wildlife. Wetlands are one of the most productive habitats on earth in terms of the variety and amount of organisms they can support. Only the rain forest is more productive than a marsh!
2. Wetlands have a great many organisms that live within their boundaries. Here is a list of organisms that live in the wetland of Barataria-Terrebonne. Display **Wetland Webs Organisms List** (**Blackline Master 1**). The list is divided into six groups. Look at the first group, the **producers**. What do they all have in common? (They are all plants). How do plants get their food? (They make their own food using sunlight, water and carbon dioxide, by the process of photosynthesis.)
3. What about the next group, the **herbivore or primary consumers**. Do they have anything in common? (All are animals.) What about the **carnivore** group. What do they have in common? (They all eat animals.) What do **omnivores** eat? (They eat both plants and animals.) What do **scavengers** eat? (They eat dead animals.) What do **detritivores** eat? (They eat decaying plant material.)
4. Detritivores often get overlooked, but in the marsh and swamp ecosystems, they are very important. They live on dead and decaying plant material called detritus. In the marsh dead and decaying

marsh grass makes up a very large part of the food supply at the beginning of the food chain. A lot of energy is locked up in the dead material and the detritivore's job is to break the materials down by converting the energy to a form that can be used further along the food chain.

5. Divide the class into six groups and assign each group to one of the groups of organisms. Each person in the group should choose their favorite organism from the list and make at least one organism card. On the card, write the name of the organism and what that particular organism eats. Then students should draw a picture of the animal or plant on the card – or students can glue a picture of the animal or plant on the card. Pass out large index cards and markers.
6. When you have finished your organism card, punch two holes in the top edge and thread a piece of yarn through it so it can be hung around the neck. Have students line up in parallel rows in the following order (from front to back).

   producers, herbivores, omnivores, carnivores, scavengers, detritivores
7. I (the teacher) represent the sun – the source of all energy on Earth. I will pass a ball of yarn to each of the producers. (Pass out the five balls of different colored yarn.) Each producer must then choose an herbivore or omnivore who would feed on it and pass the ball of yarn to them (they hold loosely to the thread). This represents passing the energy along the food chain. Now each herbivore and omnivore must find a carnivore. Pass them the ball of yarn, holding onto the thread. If one of the organisms cannot find an "eater" to eat them, hand the ball of yarn to a scavenger or the detritivore.
8. Can some organisms eat more than one kind of organisms in the web? (Yes.) Can some organisms be eaten by more than one organism in the web? (Yes.) What about the scavengers and the detritivores? (The scavengers and detritivores can actually feed at any level, but for the sake of simplicity they can come last in the food chains. Discuss with the students how the producers can directly feed the detritivores. Also, you can choose to bring in the decomposers, which have the job of breaking down the dead plant material and making it more accessible to the detritivores.)
9. What would happen to the food web if there were fewer plants? (There would not be as many animals, since there would be less available food.) What would happen if there were no scavengers? (We'd have no way of getting rid of dead animals.)
10. What would happen if this wetland was drained? Which organisms would disappear from the food web? Could this affect people? What might happen if there was an oil or chemical spill? What does this activity tell us about the value of wetland food webs to people?

Blackline Master

1. **Wetland Webs Organism List**

Assessment

- Check to see if students understand who to pass the ball of yarn to next.
- Monitor their answers to the questions in Steps 9 and 10.

Extension

The Arts:

Have students create dioramas of a chosen habitat. The dioramas can be made in a large shoe box. The dioramas can be accompanied by a written description of the habitat, the organisms that live there, and its functions and values within the Barataria-Terrebonne ecosystem.

Resources

Tradebooks:

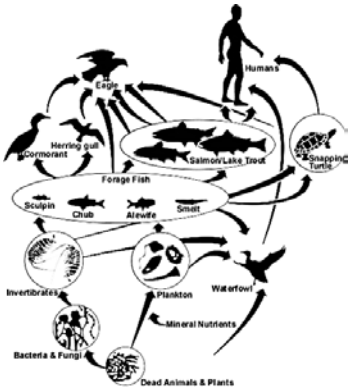
Kalman, Bobbie D. 1998. **What are Food Chains and Webs?** Crabtree Publishing Company. 32pp.
A simple introduction to food chains and webs, featuring both herbivores and carnivores and discussing energy, food production, and decomposition in various ecosystems. Age Range: 7 to 8.

Lauber, Patricia. 1994. **Who Eats What? Food Chains and Food Webs.** HarperCollins Publishers. 32 pp.
An award-winning author and artist explain how every link in a food chain is important because each living thing depends on others for survival. Age Range: 5 to 9. Outstanding Science Trade Books for Children 1996.

CDs

Louisiana Wetland Functions and Values CD developed by LSU AgCenter's Extension Service, the U.S. Geological Survey's National Wetlands Research Center and the LA Department of Natural Resources. To receive a copy, contact DNR (800/ 267-4019) or visit http://www.lacoast.gov.

Blackline Master #1



Wetland Webs Organism Lists

PRODUCERS smooth cord grass wire grass bulltongue giant cutgrass cattail three cornered grass phytoplankton alligator weed duck weed	**HERBIVORES** lubber grasshoppers nutria deer swamp rabbit	**OMNIVORES** opossum raccoon humans coot (Poule d'eau)
CARNIVORES golden silk spider alligator redfish leopard frog cottonmouth snake great egret ibis	**DETRITIVORES** amphipods fungi shrimp crawfish	**SCAVENGERS** turkey vulture crawfish shrimp blue crab house fly

Activity 2-5

Marsh Food Web Rummy

Adapted from *Welcome to the Wetlands* and
BTNEP/LSU AgCenter: *Wetland Functions, Values, and Economic Resources*

Focus/Overview

This activity is for small groups to play as a supplement to other food web activities or lessons.

Learning Objective

The learner will…

- classify wetland organisms into groups of producers, herbivores, carnivores, omnivores, scavengers and detritivores.

Louisiana Grade Level Expectations (Science)

2: GLE-46	Illustrate and describe a simple food chain located within an ecosystem (SE-E-A2).
4: GLE 71	Describe and explain food chains/webs and the directional flow of energy in various ecosystems (e.g. construct a model, drawing, diagram, graphic organizer) (SE-E-A2).
5: GLE 23	Construct food chains that could be found in ponds, marshes, oceans, forests, or meadows (LS-M-C2).

Materials List

- Wetland Webs organism cards made by the students in Activity 2-4 of this guide
- Wetland Webs Organism List from Activity 2-04 of this guide.

Background Information

Food webs can include complex interactions between a vide variety of organisms. By playing this game students will learn abut the variety of possible food webs that can exist in an ecosystem.

Advance Preparation

1. Retrieve or make the Wetland Webs organism cards from Activity 2-04 of this guide. You will need at least 48 cards for the game.

Marsh Rummy Card Game Directions and Rules

Number of players: 2, 3, or 4.
Object of the game: To make sets of *producers, herbivores, carnivores, scavengers* and *detritivores*.

1. Deal 8 cards to each player.
2. Place the rest of the cards face down on the table.
3. Turn the top card on the pile face up and place it next to the pile to begin the discard pile.
4. Player 1 (to the left of the dealer) takes a card from the pile (or from the discard pile).
5. Player 1 tries to make a set of three or more cards belonging to one of the wetland food web groups. When successful, he or she places the rummy face up on the table. Other players may then add to these cards in the course of the game.
6. After Player 1 plays his or her cards, he or she discards one card face up on the discard pile.
7. Player 2 takes a turn and play continues through the other players.
8. The first player to set down all cards is the winner.

BTNEP Connection
Living Resources

Grade Level
2, 4, 5

Duration
20-45 minutes

Subject Area
science

Setting
classroom

Vocabulary
producers, herbivores, carnivores, omnivores, scavengers and detritivores, food web

Original Source
Adapted from Welcome to the Wetlands and "Marsh Rummy Card Game" in BTNEP/LSU AgCenter: *Wetland Functions, Values, and Economic Resources*, Activity 5.

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

Blackline Master

1. Wetland Webs Organism List from **Activity 2-04** of this guide

Assessment

- Students should correctly group organisms into the proper wetland food web group.

Resources

Tradebooks:

Kalman, Bobbie D. 1998. **What are Food Chains and Webs?** Crabtree Publishing Company. 32pp ISBN: 0865058881

A simple introduction to food chains and webs, featuring both herbivores and carnivores and discussing energy, food production, and decomposition in various ecosystems. Age Range: 7 to 8.

Lauber, Patricia. 1994. **Who Eats What? Food Chains and Food Webs.** HarperCollins Publishers. 32 pp. ISBN: 0064451305

An award-winning author and artist explain how every link in a food chain is important because each living thing depends on others for survival. Age Range: 5 to 9. Outstanding Science Trade Books for Children 1996 (NSTA/CBC)

Websites and CD:

Louisiana Wetland Functions and Values CD developed by LSU AgCenter's Extension Service in conjunction with the U.S. Geological Survey's National Wetlands Center and the Louisiana Department of Natural Resources (DNR). To receive a copy, contact DNR (800/ 267-4019) or order on the Internet at http://www.lacoast.gov.

Activity 2-6

Wetlands Loss = Fisheries Loss

Adapted from BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*

Focus/Overview

In this activity, students will explore the land-water interface relationship by simulating the marsh breakup and drawing their own productivity curve.

Learning Objectives

The learner will…

- explore the relationship between marsh breakup and fisheries productivity.
- simulate marsh breakup to obtain data for drawing a curve to show the relationship.

Louisiana Grade Level Expectations (Science)

5: GLE-32	Demonstrate the results of constructive and destructive forces using models or illustrations (ESS-M-A7).
5: GLE-33	Identify processes that prevent/cause erosion (ESS-M-A7).
5: GLE-50	Describe the consequences of several types of human activities on local ecosystems (SE-M-A4).
8: GLE-53	Distinguish among several examples of erosion and describe common preventive measures (SE-M-A10).

Louisiana Grade Level Expectations (Social Studies)

8: GLE-17	Identify a contemporary Louisiana geographic issue and research possible solutions (G-1D-M4).

Materials List

- Copies of **Shrimp Productivity Grid** (**Blackline Master #1**)
- Copies of **Wetlands Loss = Fisheries Loss Data Sheet** (**Blackline Master #2**)
- Copies of **Shrimp Squares** (**Blackline Master #3**)
- Photographs of solid, unbroken marsh and of broken marsh.

BTNEP Connection
Changes in Living Resources

Grade Level
5, 8

Duration
60 minutes

Subject Area
science

Setting
classroom

Vocabulary
edge effect, extrapolation

Original Source
"Wetlands Loss = Fisheries Loss" in BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*, Activity 4.

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

Background Information

In nature all things are connected. We've learned that destroying or degrading wetland habitat can drastically reduce numbers of the organisms that depend on the wetlands. Louisiana's economy depends heavily on its huge commercial fishery. The Barataria-Terrebonne estuary boasts an annual seafood harvest worth more than $200 million. This is because the marsh provides and ideal nursery ground for many economically important species including shrimp, crabs, menhaden, redfish and other finfishes.

As marsh breaks up, it creates many small islands of marsh grass. This has an effect that is unexpected at first glance, but which has been confirmed by data collected by scientists. The broken marsh can actually temporarily support more organisms than the unbroken marsh. This is because of a phenomenon scientists call "**the edge effect**".

The edge effect concerns the increased numbers of organisms supported at the interface between habitats. In this case the edge is between the marsh and shallow open water habitat. As the marsh breaks up, the many small islands of marsh provide more surface area of edge for organisms to feed on detritus formed from decaying marsh grasses. This area is called the **land-water interface**.

Also, as the marsh breaks down because of erosion, energy is released into the shallow water system. As the marsh continues to break down, and the small islands get smaller, there is a point when the

habitat no longer is able to support the food web. At this point the number of seafood organisms begins to decline. Scientists have plotted a graph to show this relationship between the area of marsh and numbers of shrimp supported, through a method known as **extrapolation**. This is theoretical curve – the graph estimates how this relationship may interact in nature.

Advance Preparation

1. Obtain photographs of solid, unbroken marsh and of broken marsh.
2. Run off student worksheets (**Blackline Masters #1-3**).
3. Create and cut shrimp squares, about 25 shrimp per envelop (**Blackline Master #4**) OPTIONAL
4. Stuff envelopes with shrimp squares. (One envelop per student). OPTIONAL

Procedure

1. Scientists have been able to express the seriousness of continued marsh loss by using the Marsh Loss-Fisheries Productivity Curve. We will explore this relationship between marsh loss and fisheries productivity. At present, the seafood industry is not experiencing reduced catches because of marsh loss. In fact, record numbers of shrimp and crabs were caught in recent years. This can be explained by a concept scientists call the ***edge effect*** or the ***land-to-water interface***. As larger areas of marsh break up into smaller areas, there is more marsh edge or interface for the juvenile (young) shrimp and crabs to feed. Also, as the marsh erodes and the grasses decay, more energy is added to the food chain. This actually helps support more organisms, which is translated into short-term increases in seafood harvest. But some scientists predict times of abundance may begin to come to an end if the deterioration of the coastal marshes continues. The volume of seafood harvested may decline as the smaller areas of marsh disappear and a decline in food and cover occurs.
2. Today we will create a simplified model of this phenomenon. Each of you will receive a sheet with a large square divided into 25 smaller squares. Each side has five squares. The large square represents a large area of marsh. (Pass out **Shrimp Productivity Grid** -**Blackline Master #1.**) You are also getting an envelop that contains many small squares with shrimp drawn on them. (This is optional. Older students can just count perimeter square edges.)
3. The first thing we'll do is place shrimp squares against the edge of each outside square of the large area. This is the number of square edges on the perimeter of the marsh area and represents the number of shrimp the large area of marsh can accommodate. Record this number on your data sheet in the fourth column. This is not really true to life because shrimp don't just feed around the edge, but we are making a simplified model to illustrate the edge effect.
4. Now we'll simulate cutting a canal through our area of solid marsh by shading in the center row of squares all the way across the marsh. Record the number of squares in each of your two new areas that were created. Now, for each of the two new areas we have made, we can place shrimp along the edges created by the canal. Count how many shrimp will fit around each of the new areas. Record this total number on your data sheet. (Use a large replica of the square "marsh" drawn on an easel pad, overhead transparency or chalk board. Show students how to shade their "canal" squares as you go.)
5. Next we'll cut another canal down from top to bottom of the marsh by shading the center column. Record how many squares are in each of the four new smaller areas. Record the total number of squares of marsh. Now count how many shrimp will fit around the edges of each of your four new pieces of marsh. Add the numbers to get a total and record this total on your data sheet.
6. Now, the first canal is eroding because of boat traffic and saltwater intrusion, and in time it doubles in width. We can show that by shading in the next row down all the way across. Record the number of squares in each new piece of marsh. Your new pieces of marsh are unequal in area now, so be careful in your counting and recording. Add the total and record it on your data sheet. Count how many shrimp will fit against the squares around the perimeter of each of your pieces of marsh. Record the total number on your data sheet. (Note that canal building and widening are not the only ways in which the marsh erodes. This activity oversimplifies this concept. Be sure to emphasize to your students that marshes break up because of the interaction of a number of factors and making "canals" on the grid simulates these factors.)
7. Now, the second canal erodes and doubles in width. Shade the column of squares to the right of your first column to widen the second canal. Count the number of squares in each piece of marsh. Record the numbers and the total on your data sheet. Count the number of shrimp you can accommodate around the perimeter of each marsh piece. Record the total number on your data sheet.

8. We will continue to widen each canal, one at a time, by shading rows and columns and counting the numbers of squares of marsh remaining and counting how many shrimp are able to feed around the edge of each piece. Be careful when counting and recording. You'll need to use these numbers to create a graph. If you make a mistake, your graph will not come out correctly.
9. When you have finished recording all the figures on your data sheet, use them to construct a line graph of "shrimp productivity" (figures in Column 4 of the data sheet) on the "Y-axis" against the "erosion" (figures in Column 1 on the data sheet) on the "X-axis".

Blackline Masters

1. **Shrimp Productivity Grid**
2. **Wetlands Loss = Fisheries Loss Data Sheet**
3. **Wetlands Loss = Fisheries Loss Data Sheet (Answer Key)**
   Please note that one answer is illustrated in the key. There are numerous answers to this exercise depending on the order that the students choose to shade in the vertical columns and horizontal rows. The general shape of the curve will remain consistent.
4. **Shrimp Squares**
5. **Fringe Effect Illustration**

Assessment

- Graphs can be assessed as to whether the student has correctly completed the activity.
- Student summary of the meaning of the graph can be graded and their understanding of the relationship between habitat degradation and shrimp populations (the edge effect).

Resources

BTNEP Resources:

Portrait of an Estuary, publication by LSU AG and BTNEP
Saving Our Good Earth: A Call to Action. BTNEP Characterization Report (contact BTNEP for copies).

Tradebooks:

Cherry, Lynne. 2000. **Great Kapok Tree: A Tale of the Amazon Rain Forest.** Harcourt . 40pp.
A man walks into a lush rain forest and starts chopping down a huge kapok tree. Lulled by the heat, he sits down and soon falls asleep. The forest dwellers approach, each pleading a reason to keep the tree standing. Suddenly, the man wakes up, and for the first time notices the beauty all around him. Will he still chop down the tree? Age Range: Young Adult.

Jam, Teddy. 1997. **Fishing Summer**. Groundwood Books. 32pp. ISBN: 0888992858
Polluted waters and reduced fish populations are environmental disasters the world over. To help children understand what such a loss means, Canadian author Teddy Jam tells the moving story of the world, not so long ago, when the seas were full of fish. Full color. Age Range: 5 to 7.

Miller, Christina G. and Louise A. Berry. 1989. **Coastal Rescue: Preserving Our Seashores**. Simon & Schuster Children's Edition. 128pp. ISBN: 0689312881
Examines different types of coasts, how they are shaped by nature, how the development of coasts has disrupted the coast, and ways to use the coast's valuable resources and still preserve them. Age Range: 12 & up.

Geisel, Theodore. 1976. **Lorax**. Random House, Inc. 70pp. ISBN: 0394823370
In this classic story, the Once-ler describes how his greedy actions destroyed a beautiful and thriving environment. Age Range: 4 to 8.

Websites:

Louisiana Department of Natural Resources, ***Louisiana Coastal Facts***, accessed July 26, 2004, at http://www.savelawetlands.org/site/webfactsheet.pdf

CDs

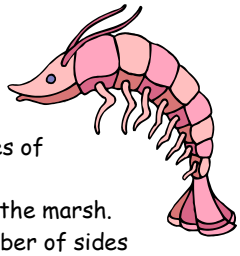
Louisiana Wetland Functions and Values CD developed by LSU AgCenter's Extension Service, U.S. Geological Survey's National Wetlands Center and the LA Department of Natural Resources (DNR). To receive a copy, contact DNR (800/ 267-4019) or order on the Internet at http://www.lacoast.gov.

References:

Coalition to Restore Coastal Louisiana. No date. **No Time to Lose**: **Facing the Future of Louisiana and the Crisis of Coastal Land Loss.** . Accessed 4/13/05 at http://www.crcl.org/no_time_to_lose.pdf.

Blackline Master #1

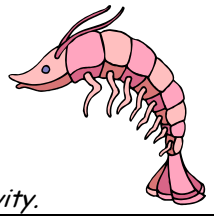
Shrimp Productivity Grid



Directions.

1. The grid below represents a 25-acre area of marsh. On your data sheet record the number of square in the area and the number of sides on the perimeter. The edges or sides of your area represent feeding opportunities for shrimp.
2. Shade the center horizontal row of squares to represent a canal that has been dug across the marsh. Record the number of squares of remaining unbroken marsh. Calculate and record the number of sides on the perimeter of the two marsh areas.
3. Make another canal by shading the center vertical column. Again, count and record the number of squares remaining of unbroken marsh. Count and record the number of the sides on the perimeter of the four marsh areas.
4. Widen the canals row by row, column by column, to represent erosion, each time recording the total number of marsh squares remaining and the number of sides on the perimeters of the marsh areas. Continue until all of the squares are shaded and you have filled in your data sheet.
5. Use the data to graph shrimp productivity vs. erosion.

Blackline Master #2



Wetlands Loss = Fisheries Loss
Data Sheet

Complete this data table as you follow the directions on the Shrimp Productivity Grid activity.

1 erosion (number of rows or columns shaded	2 number of pieces of intact marsh	3 total area of marsh remaining	4 total number of shrimp that fit around perimeter of marsh areas
0	1	25	
1	2		
2	4		
3			
4			
5			
6			
7			
8			
9			
10			

Graph of Marsh Loss and Shrimp Productivity

Plot a bar graph showing the relationship between shrimp productivity (Column 4; number of perimeter segments) and erosion (Column 1).

Productive Permieter (perimeter edges)

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

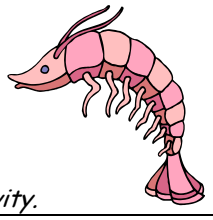
Erosion

Summary of Marsh Loss and Shrimp Productivity

On a separate sheet of paper, examine your graph and data, then summarize the relationship between marsh loss and shrimp productivity in a sentence or two.

Blackline Master #3

Sample Answer Key



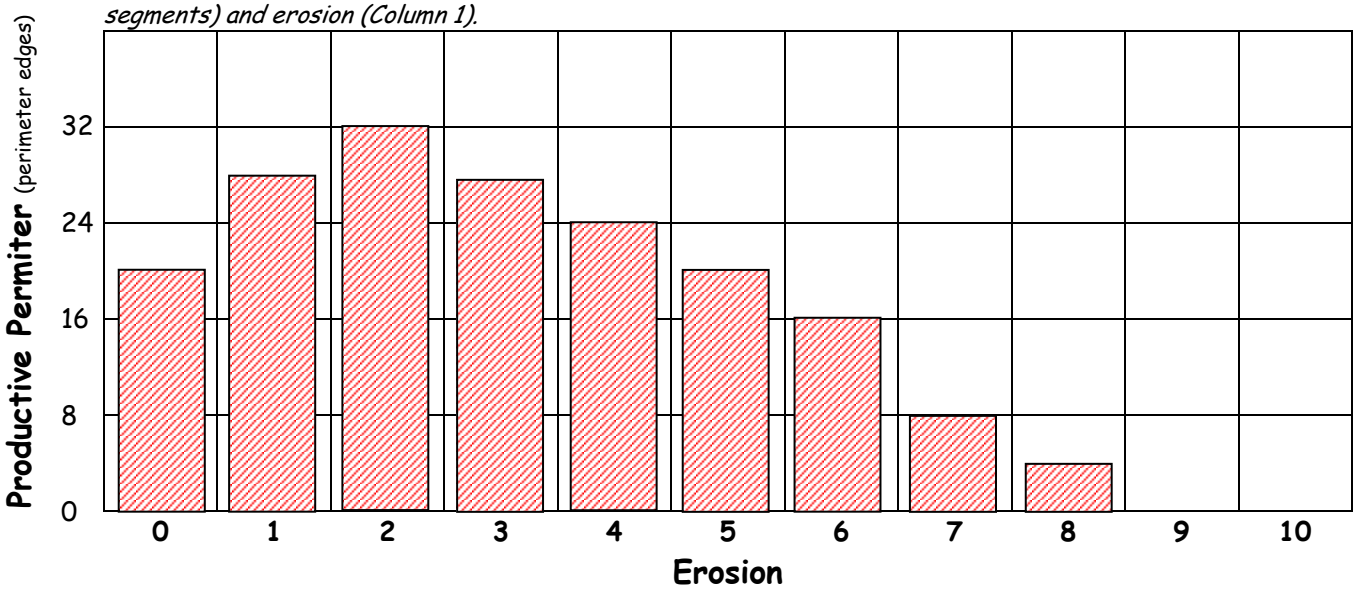
Wetlands Loss = Fisheries Loss
Data Sheet

Complete this data table as you follow the directions on the Shrimp Productivity Grid activity.

1 erosion (number of rows or columns shaded	2 number of pieces of intact marsh	3 total area of marsh remaining	4 total number of shrimp that fit around perimeter of marsh areas
0	1	25	20
1	2	20	28
2	4	16	32
3	4	12	28
4	4	9	24
5	4	6	20
6	4	4	16
7	2	2	8
8	1	1	4
9	0	0	n/a
10			

Graph of Marsh Loss and Shrimp Productivity

Plot a bar graph showing the relationship between shrimp productivity (Column 4; number of perimeter segments) and erosion (Column 1).

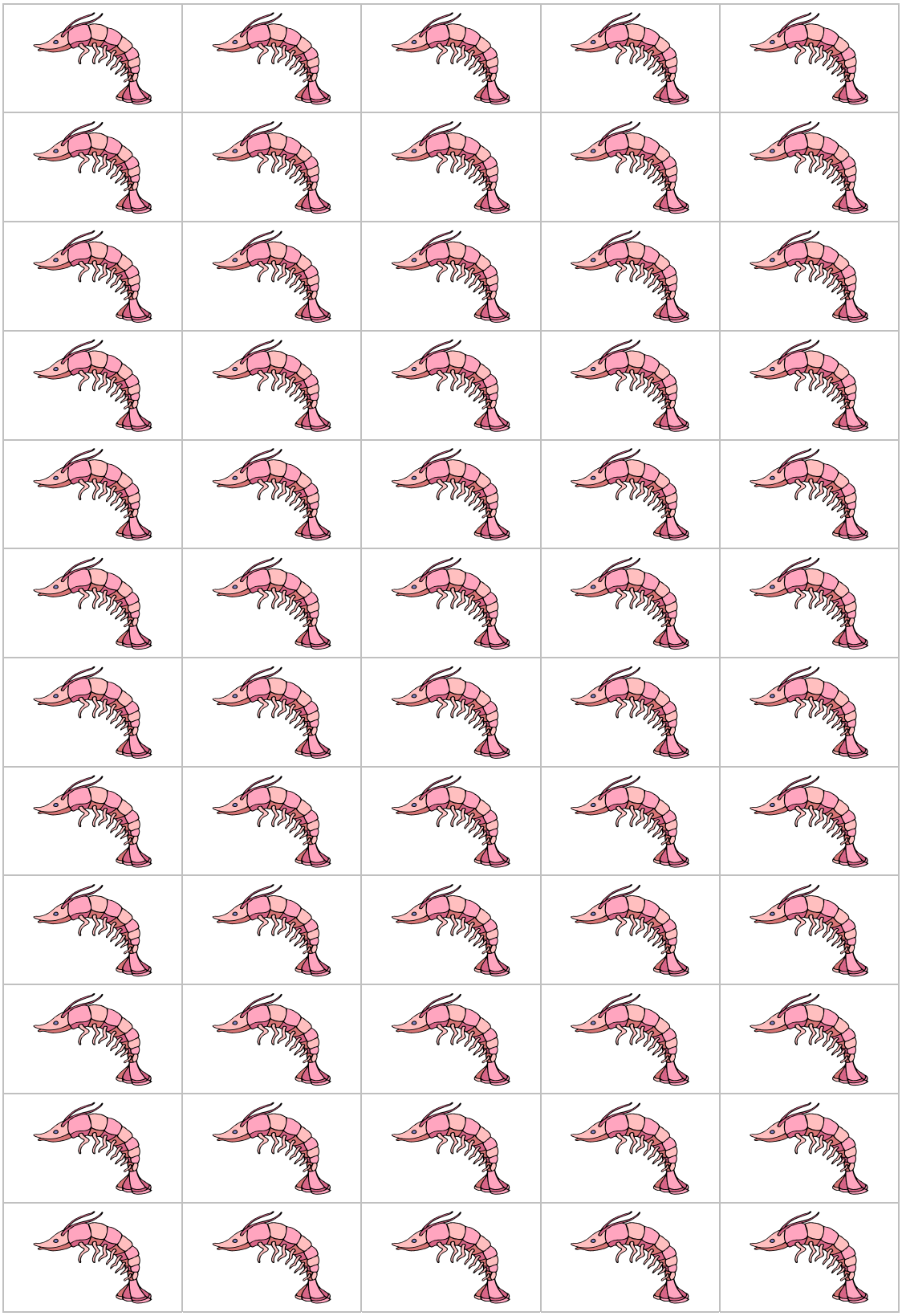


Summary of Marsh Loss and Shrimp Productivity

Initially the amount of perimeter increases as erosion begins. But after a certain point (#2 above), the amount of perimeter begins to decrease. This reflects the initial rise in productivity (amount of plants and animals) as marsh begins to break up, and then the steady decline in productivity as the productive perimeter continues to decline.

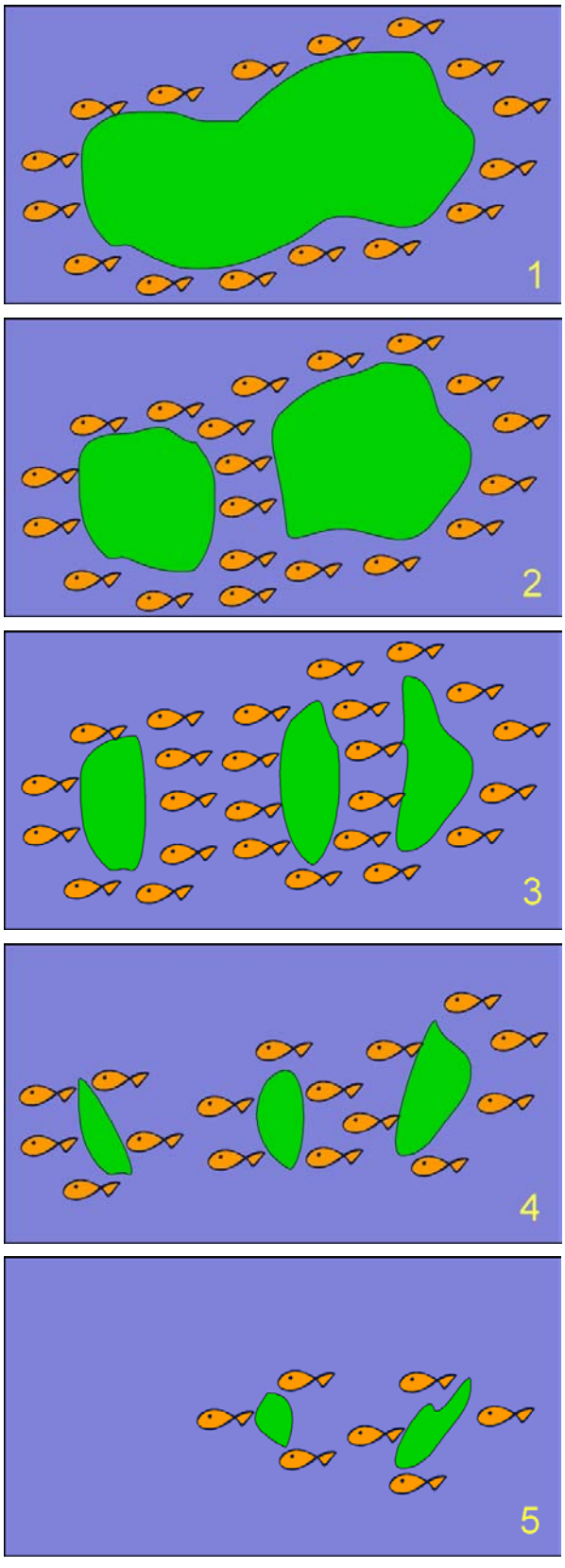
Blackline Master #4

Shrimp Squares



Blackline Master #5

The Fringe Effect



Activity 2-7

Nutria: Nutrition or Nuisance

Adapted from BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*

Focus/Overview

Student will learn about nutria, the nutritional value of nutria meat and develop a persuasive argument for eating nutria. An optional activity is to prepare a nutria dish and have a nutria-tasting event at school.

Learning Objectives

The learner will…

- gather information about nutria, including the nutritional value of nutria meat.
- draw a food web for nutria that includes humans as a consumer of nutria meat.
- create a publicity package for the purpose of advertising a nutria food product.
- make a simple dish using nutria meat.

Louisiana Science Grade Level Expectations

4: GLE-71	Describe and explain food chains/webs and the directional flow of energy in various ecosystems (e.g., construct a model, drawing, diagram, graphic organizer) (SE-E-A2).
5: GLE-23	Construct food chains that can be found in ponds, marshes, oceans, forests, or meadows (LS-M-C2).
5: GLE-24	Describe the roles of producers, consumers, and decomposers in a food chain (LS-M-C2).

Materials List

- Pictures of nutria.
- Fresh, deboned nutria meat from a licensed meat processor (optional, see resource section for details)
- Computer and Internet access.

BTNEP Connection
Changes in Living Resources

Grade Level
4, 5

Duration
2 days

Subject Area
science, health

Setting
classroom

Extension Area
school-wide

Vocabulary
Herbivores, eatout

Original Source
"Nutria: Nutrition or Nuisance" in BTNEP/LSU AgCenter: *Coastal Land Loss and Restoration*, Activity 5.

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

Background Information

Nutria is a non-native nuisance species of rodent that is causing big problems in Louisiana wetlands. Nutria are vegetarians, or **herbivores**, and when they eat wetland grasses, they eat the tender shoots as well as the roots of the grasses. Nutria are an invasive species, diminishing resources for native creatures.

During the past 10 to 15 years, nutria have emerged as serious pests in the coastal wetlands of Barataria-Terrebonne estuary. Scientists at Louisiana State University Coastal Ecology Institute confirmed many people's suspicions about the nutria's destructive capabilities in an experiment in which they fenced areas of marsh to exclude nutria and waterfowl. After one year, there was a dramatic difference between the protected and unprotected plots; the experiment showed that both nutria and waterfowl grazing can significantly reduce the vegetation. If nutria and ducks feed together, the results can be devastating, with all except a few species of plants destroyed. When nutria denude an area of vegetation, it is called an "eatout". Vegetation is essential to hold soil in place and to prevent wave erosion, so the grazing habits of nutria and ducks contribute significantly to coastal land loss.

Nutria were introduced to Louisiana in the 1930s from South America. The conditions in the Louisiana coastal marshes are ideal for the success of these fast-breeding, plant-eating rodents. In addition, few predators are large enough to tackle a full-grown nutria, so the only factors that can check the growth of the nutria population are cold winters, hurricanes, lack of food, large alligators and human trappers. None is a strong enough force in Louisiana to keep numbers down so the population has continued to increase at an alarming rate. Nutria were once trapped in large numbers for their fur, but today the fur market supports only a small nutria harvest.

Discussions on how to solve the nutria overpopulation problem have continued for years without a satisfactory conclusion. In the early 1990s, the Louisiana Nature Center (Audubon Institute) sponsored several Nutria Fests at which celebrated area chefs cooked delicious nutria dishes. These events raised public awareness to the nutria dilemma and suggested a novel solution: LET'S EAT NUTRIA! In the 1960s the same suggestion was made, mainly as a way to increase the economic benefits realized from nutria harvests. Millions of dollars worth of nutria meat was going to waste when the animals were harvested only for fur. At that time, an LSU study looked at the values of nutria as a source of meat. In all aspects – from taste and nutritional value to appearance – dishes made from nutria scored high.

The prejudice of many about nutria being "dirty rodents" is unfounded according to the report. Nutria have more sanitary habits than most domestic animals and have a purely vegetarian diet. The general public of south Louisiana has not yet accepted nutria burgers as a food choice. Perhaps a greater understanding of this wetland herbivore will help to increase its popularity as a culinary delight.

Sample Recipe
Nutria meat can be used in many standard Cajun recipes, such as Nutria Sauce Piquant, Nutria Sausage, Nutria Gumbo, etc. Nutria can be substituted for chicken or another lean meat in many recipes. Here's a simple recipe requiring few ingredients and little preparation.

Chicken-Fried Nutria

Ingredients
young nutria meat obtained from a licensed meat processor*, cut into thin strips
½ cup milk
flour or corn meal
salt and pepper and/or other Louisiana seasoning product
vegetable oil
salad ingredients

Equipment:
hot plate
iron skillet or frying pan
spatula
slotted spoon
plates
eating utensils
large bowl

1. Mix flour or corn meal and seasoning in a large bowl.
2. Dip nutria meat strips into milk and place in coating mix.
3. Thoroughly coat nutria meat with coating mix
4. Heat ½" deep vegetable oil in iron skillet or frying pan until hot enough for frying.
5. Carefully add coated nutria strips and fry until golden brown on all sides (about 10-15 minutes).
6. Serve with a salad of your choice.

** For current information on nutria meat processing regulations and sources of nutria meat, call the Louisiana Department of Wildlife and Fisheries at (337) 373-0032.*

Procedure

1. Nutrias are an animal that have caused many problems in Louisiana. What are some of the problems that nutria have caused? One of the big problems nutria are responsible for is the loss of vegetation. What is it that nutria eat? (They eat the soft tissues of plants, especially roots. In marsh areas, this means they actually pull the plant up out of the marsh and eat the roots and tender young shoots. In higher areas, such as swamps, nutria eat young cypress and other trees, as well as the bark off of old trees.) Let's draw a food web for the nutria. Begin by drawing what the nutria eat. Now, what eat's nutria? (Alligators, hawks, eagles.) Because nutria are vegetarians (they only eat plants), they are also a good food source for humans. Draw humans into the nutria food web. But getting people to eat nutria meat is often difficult. Why might this be?

2. Our task today is to gather information about nutria so we can put together a publicity package designed to convince people that nutria are a good food source. What can you tell me about nutria? We need to include all kinds of information in our list, including appearance, behavior, life history and what their meat tastes like. (List student knowledge on the board or overhead transparency.)
3. Now we need to arrange all this information into clusters. (Cluster the information into items under headings such as appearance, breeding, diet, behavior, nutritional value, etc.) Looking at this list, what else do we need to know about nutria to put together our publicity package? (Make a list of things that need to researched.)
4. Assign students to research groups. Have each group report back to the class what their research has uncovered about nutria.
5. Now that we have all the information we need, your job is to create a publicity package for nutria as a food item. Think of all the positive aspects of nutria meat, and also think about the negative things that might keep people from eating nutria meat. Work on persuading them to think differently. Your publicity package should contain a fact sheet about nutria, at least one picture and a recipe using nutria meat. The fact sheet should contain only truthful information and give the positive side of nutria as a food source.
5. After the publicity packages are prepared, hold a nutria cook-off or make one dish in class if resources are limited. This can be coordinated in any practical way for the circumstances at your school.

Blackline Master

1. **Nutria Resource Sheet**

Assessment

1. Develop a rubric to assess the publicity packages.
2. Have students take their nutria food webs and label each organism as either a producer, consumer or decomposer.

Extensions

Publicize and hold a school-wide event at which teachers, parents and students can sample the nutria dish(es) prepared and read the publicity materials students prepared.

Resources

Orange Tooth is Here to Stay, Audubon: Magazine of National Audubon Society, July 1990, v. 92(4).
Glasgow, L.L., and L.A. McCollough. 1963. **Nutria for Home Use.** Louisiana State University
Erosion Increase by Nutria Grazing, Louisiana Environmentalist, July/August 1994, p. 18

WEBSITES

Faibisch, Jacob. 2002. **Case Studies. Ravenous Rodents: The Case of Nutria (*Myocastor coypus*) in Louisiana**. International Association of Fish and Wildlife Agencies. Accessed 04/15/05 at http://www.furbearermgmt.org/casestudies3.asp.

Short informative article on nutria problem in Louisiana. Includes pictures of nutria exclusion experiments.

Roman, Joe. **Eat the Invaders!** in Audubon: Magazine of National Audubon Society, Green Gourmet Section, October 2004, online magazine accessed 4/15/2005, at http://magazine.audubon.org/features0410/gourmet.html).

As marauding hordes of invasive species devour heaping helpings of the North American landscape, we offer some recipes that might help turn the tables.

Louisiana Coastal Wetlands Planning, Protection and Restoration News. **Nutria: Destroying Marshes the Old Fashioned Way**. *in* WaterMarks. June 2000 Number 16 Accessed 04/15/05 at http://www.lacoast.gov/watermarks/2000b-06/index.htm.

Nutria biofacts and information on the nutria meat economic development plan. Nutria recipe included.

Louisiana Department of Wildlife and Fisheries, **Nutria**, accessed 07/05/05 at http://www.nutria.com/site.php

Nutria information including history, wetland damage and biology, as well as information on fur industry.

Blackline Master #1

Nutria Resources

Faibisch, Jacob. 2002. **Case Studies. Ravenous Rodents: The Case of Nutria (*Myocastor coypus*) in Louisiana**. International Association of Fish and Wildlife Agencies. Accessed 04/15/05 at http://www.furbearermgmt.org/ casestudies3.asp.

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Nutria information including history, wetland damage and biology, as well as information on fur industry.

Activity 2-8

Trading Spaces: Invasive Species

Cally Chauvin

Focus/Overview

Invasive species are affecting our natural environment. Several of these species are causing devastating damages to our marsh and waterways. This project will help students realize the extent of the problems and get them involved in possible ways to combat these problems.

Learning Objectives

The learner will…

- identify several major invasive species in their ecosystem.
- research the history of how they were introduced to Louisiana.
- state the affects that these invasive species have on the environment.

Louisiana Science Grade Level Expectations

5: GLE-50	Describe the consequences of several types of human activities on local ecosystems (e.g., polluting streams, regulating hunting, introducing nonnative species) (SE-M-A2).
7: GLE-39	Analyze the consequences of human activities on ecosystems (SE-M-A4).
HS Env Sci: GLE-10	Analyze the effect of an invasive species on the biodiversity within ecosystems (SE-H-A9).

Materials List

- Poster and Cooperative Group Grading Criteria
- Trading Spaces template
- Computer and Internet access.

Background Information

On February 3, 1999, Executive Order 13112 was signed by President Clinton establishing the National Invasive Species Council. The Executive Order requires that a Council of Departments dealing with invasive species be created. Currently there are 10 departments and agencies on the Council.

BTNEP Connection
Changes in Living Resources

Grade Level
5, 7, Env. Science

Duration
90 minutes

Subject Area
science, language arts, history

Setting
classroom

Extension Area
science

Vocabulary
invasive species, habitat

Original Source
Author: Cally Chauvin

BTNEP Barataria-Terrebonne National Estuary Program
www.btnep.org

Working Definitions (based on Executive Order 13112)

- Invasive species: a species whose presence in the environment causes economic or environmental harm or harm to human health.
- Non-indigenous (non-native) species: with respect to a particular ecosystem, any species that is not found in that ecosystem. Species introduced or spread from one region of the US to another outside their normal range are non-indigenous, as are species introduced from other continents

Ecological Impacts on invasive species:

- **Competition** with local species
- **Change to ecosystems**, in which even a whole food web can change
- **Domination of ecosystems** by an introduced species is an extreme case (Zebra Mussel)
- **Disease**: invasive species may carry diseases to which native species are not adapted.
- **Hybridization** occurs when introduced species may not be quite genetically separated from a native species, and can then proceed to hybridize.

Advanced Preparation

1. Refine the Group and Oral Presentation Rubric (**Blackline Master #1**) to meet your expectations.
2. Run of copies of the Trading Spaces Rubric and Template (**Blackline Master #2**) along with the Oral Presentation Rubric.

Procedure

1. Show a large picture of a water hyacinth in bloom. Ask the students to tell you where they might have seen this plant.
2. Explain to the students that this is one of several invasive species found throughout Louisiana. Have the students create a KWL chart to give you an idea of what students know. Give the definition of invasive species.
3. Give the students a list of invasive species in your area. *Use the Portals & Pathways Map available at* http://www.cbr.tulane.edu/is/.
4. Place the students in cooperative groups in fours.
5. Assign roles to each group member: PI = Principal Investigator (Leader-makes sure everything is being done), TW =Tech Writer (recorder – records what reporter will say), TR = Tech Reporter (Major presenter-orally presents ideas of group, *only person to ask the teacher questions about the project*.), TD = Tech Designer (Drawer & materials person-hands on).
6. Hand out the directions and rubric for the Trading Spaces Poster Rubric. Have students create 11x17" posters of information on their invasive species based on the characteristics described in the rubric.
7. Allow students time to research their invasive species. See the websites listed under Resources.
8. Attach all posters to form a mural. (Publish in a hallway to show off your classes' work).
9. Have each group prepare a five to ten minute oral presentation on their invasive species. Oral presentation must give the following information: name of species, brief history, problems associated with species, control efforts, suggested interventions by group members.

Blackline Masters

1. **Cooperative Group and Presentation Rubric**
2. **Trading Spaces Poster Template and Rubric**

Assessment

- See attached rubrics

TEAM WORK GRADING CRITERIA

Name _____ Date _____ Class _____

Team Work Grading Criteria

	Self Check Yes or No	**Points**
1. My Role	Did I do my assigned role to the best of my ability? **Y or N**	**/4**
2. Participation	Did I help with the assigned work equally? **Y or N**	**/4**
3. Attitude	Was I positive, respectful, and able to assist others? **Y or N**	**/4**
	TOTAL	**/12**

Extension

Science

Show the video "Non-invasive species" by Louisiana Public Broadcasting's ***Envirotacklebox*** Project at http://www.envirotacklebox.org/modules/m3nonntv.htm (Gives teachers guide & info).

Resources

WEBSITES

Center for Bioenvironmental Research, Tulane University, no date, ***Portals and Pathways***, accessed July 22, 2005 at http://www.cbr.tulane.edu/is/

Comprehensive website on invasive species in Louisiana.

Louisiana Marine Education Resources, Louisiana Sea Grant College Program, no date, ***Exotic Aquatics of the Gulf Coast,*** accessed July 22, 2005 at http://lamer.lsu.edu/topics/exotics/exotics_list.htm.

Information on nutria, water hyacinth, hydrilla and zebra mussels in Louisiana. Useful links elsewhere.

Louisiana Marine Education Resources, Louisiana Sea Grant College Program, no date, ***Be On the Lookout! Brochure***, accessed July 22, 2005 at http://lamer.lsu.edu/topics/pdfs/NIS_lookout.pdf.

Information on nutria, water hyacinth, hydrilla and zebra mussels in Louisiana. Useful links elsewhere.

InvasiveSpecies.Gov, Louisiana Sea Grant College Program, April 13, 2005, ***InvasiveSpecies.Gov website***, accessed July 22, 2005 at http://www.invasivespecies.gov/geog/state/la.shtml.

A gateway to federal and state invasive species activities and programs. Very useful site.

Blackline Master #1

Group Species Name _____ Date _____ Class _____

Team Members and Roles:

PI: _____= **Principal Investigator (Leader-makes sure everything is being done)**

TW: _____ = **Technical Writer (Recorder – records what reporter will say)**

TD: _____ = **Technical Designer (Drawer & materials person, *hands on*)**

TR: _____ = **Technical Reporter (Major presenter-orally presents ideas of group, *only person to ask the teacher questions about the project*.)**

Trading Spaces Poster Grading Criteria

	Self Check Yes or No	Points
1. Name of your invasive species (Bold)	Is the name my species in bold letters? **Y or N**	**/2**
2. Scientific name in parenthesis under title.	Is the scientific name in () under the title? **Y or N**	**/2**
3. Provide at least three picture of your species.	Did I display at least 3 pictures of my species? **Y or N**	**/6**
4. Draw or attach pictures which show where the invasive species came from & how it came to LA.	Did I show where my species came from & how it got to La? **Y or N**	**/10**
5. Draw the habitat where your species is located presently in LA.	Did I draw the habitat where my species lives in La.? **Y or N**	**/5**
6. Draw or attach pictures of how your species harms LA.	Did I show my species harms La.? **Y or N**	**/5**
7. Draw or attach pictures of at least one way to control or destroy my invasive species.	Did I show at least one way to control or destroy my species? **Y or N**	**/5**
8. Neat and legible	Is my poster neat? Is my poster legible? **Y or N**	**/5**
9. Grammatically Correct; No spelling or word errors	Is my poster free of grammatical errors? **Y or N**	**/5**
10. Wise use of color	Is my poster colorful? Is color used wisely? **Y or N**	**/2**
	TOTAL	**/50**

R Name _____ Date _____ Class _____

Oral Presentation Shared Responsibility Grading Criteria

	Self Check	Points
1. TR introduces team, roles, etc.	Did the TR introduce everyone & their roles? **Y or N**	**/5**
2. TR states the species name.	Did the reporter tell what invasive species your team had? **Y or N**	**/1**
3. Voice Control	Did I speak clearly & so the audience could hear me? **Y or N**	**/5**
4. Eye Contact	Did I look at the audience? **Y or N**	**/4**
5. Use of Poster	Did I use the poster to help with my presentation? **Y or N**	**/3**
6. Team Effort	Did I support my team members during the presentation? **Y or N**	**/3**
	TOTAL	**/21**

PI Name _____ Date _____ Class _____

Oral Presentation Shared Responsibility Grading Criteria

	Self Check	Points
1. PI gives a brief history	Did the PI give a brief history of your species? **Y or N**	**/5**
2. Voice Control	Did I speak clearly & so the audience could hear me? **Y or N**	**/5**
3. Eye Contact	Did I look at the audience? **Y or N**	**/4**
4. Use of Poster	Did I use the poster to help with my presentation? **Y or N**	**/3**
5. Team Effort	Did I support my team members during the presentation? **Y or N**	**/3**
	TOTAL	**/20**

TW Name _____ **Date** _____ **Class** _____

Oral Presentation Shared Responsibility Grading Criteria

	Self Check	Points
1. TW tells the problems with the species	Did the TW give the problems associated with the species? **Y or N**	**/5**
2. Voice Control	Did I speak clearly & so the audience could hear me? **Y or N**	**/5**
3. Eye Contact	Did I look at the audience? **Y or N**	**/4**
4. Use of Poster	Did I use the poster to help with my presentation? **Y or N**	**/3**
5. Team Effort	Did I support my team members during the presentation? **Y or N**	**/3**
	TOTAL	**/20**

TD Name _____ **Date** _____ **Class** _____

Oral Presentation Shared Responsibility Grading Criteria

	Self Check	Points
1. TD talks about location, habitat	Did the TD tell where it lives in LA & its habitat? **Y or N**	**/5**
2. Voice Control	Did I speak clearly & so the audience could hear me? **Y or N**	**/5**
3. Eye Contact	Did I look at the audience? **Y or N**	**/4**
4. Use of Poster	Did I use the poster to help with my presentation? **Y or N**	**/3**
5. Team Effort	Did I support my team members during the presentation? **Y or N**	**/3**
TOTAL		**/20**

Blackline Master #2

Name _____ **Date** _____ **Class** _____

TRADING SPACES Poster Template

Directions:

Using two pieces of 11x17" poster paper, create the front and back of your Trading Spaces poster for the exotic species your group has chosen to learn about. Refer to the Trading Spaces Poster and Oral Presentation Rubric for guidance about what and how to include all the information on your Trading Spaces Poster.

Front of Trading Poster

Illustration and images go here

Location Map

Back of Trading Poster

Name of Species
(*Scientific name*)

Information:

References Cited:

Activity 3-1

What is Freshwater and What is Saltwater?

Focus/Overview

The amount of water, and the amount of salts dissolved in that water, determines the type of biological community a particular ecosystem can support. In this lesson, students will use their sense of taste to distinguish between fresh and saltwater. They will locate on a map of Louisiana major rivers (freshwater), the Gulf of Mexico (saltwater), and the Barataria Bay (an estuary – where fresh and saltwater mix). They will set out salt and freshwater samples to evaporate overnight and then make observations on what they find the next day.

BTNEP Connection
Water Quality

Grade Level
K-8

Duration
35 minutes

Subject Area
science

Setting
classroom

Extension Areas
language arts, social studies, mathematics, art

Vocabulary
freshwater
saltwater
estuary

Original Source
V. Butler's Writing Team

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

Learning Objectives

The learner will…

- use his/her five senses to describe the difference between freshwater and saltwater.
- describe and illustrate what happens after water evaporates from a saltwater and freshwater solution.
- Identify the Gulf of Mexico, rivers, bays and estuaries on a map of Louisiana and whether they contain freshwater, saltwater, or a mix of both fresh and saltwater.

Louisiana Science Grade Level Expectations

K: GLE-4 1: GLE 5 2: GLE 6	Use the five senses to describe observations (SI-E-A3).
2: GLE19	Describe and illustrates what happens after water evaporates from a salt or sugar solution (PS-E-A5).
2: GLE 37	Compare bodies of water found on Earth (ESS-E-A2).

Materials List

- 1 gallon of distilled water
- 1 gallon of saltwater
- small paper cups (2 per child)
- napkins
- small clear plastic cups (2 per group)
- paper maps of Louisiana

Background Information

Rivers deliver freshwater to the oceans and seas. In Louisiana, the Mississippi and Atchafalaya Rivers carry large amounts of freshwater to the Louisiana coast and discharge this freshwater into the Gulf of Mexico or large bays protected by barrier islands. The places where the freshwater from the rivers mixes with saltwater from the Gulf of Mexico are called estuaries. This mixing of waters happens in the large bays and protected marshes along the Louisiana coast.

The salinity of water that occurs in a particular place is one of the important things that determines the kinds of plants and animals that can live in that location. Certain kinds of animals and plants can only live in freshwater marshes, while others prefer a more salty environment of the saltwater marshes. This preference for environment, based on the saltiness of the water, means that the marshes can be divided into zones based on the amount of salt in the water. The most inland zone is the freshwater marsh. The next zone closer to the Gulf of Mexico is slightly salty and is called the brackish marsh. The marsh

closest to the beach is called the salt marsh. These zones are all part of an area called an estuary, which is a place where freshwater from the rivers mixes with saltwater from the sea.

Estuaries are very important nurseries for many species of fish, crustaceans and shellfish. Many species of animals spend at least part of their life cycle in the protected waters of the estuary feeding and growing larger.

Advance Preparation

1. The teacher should have chart paper ready and colorful map of the United States and Louisiana.
2. The teacher should have enough paper cups labeled with A and B for the taste test.
3. Label a container of distilled water with a letter A. Prepare 1 gallon of saltwater by adding 3 tablespoons of salt to the gallon of water and mixing well. Label this container B.

Procedure

1. Begin by asking the children if they have ever visited a beach. What things might you find on a seashore *(seashells, sand, trash, salty water, etc.)*. Has ever been swimming in a river? (If not, then a swimming pool). What kinds of things do you find in and along a river? *(trees, bushes, minnows, etc)* Great!
2. In what ways are the sea and the river similar? *(Both have water and a place where the water meets the land. Both have plants and animals that live in or near them.)* In what ways are the sea and the river different? *(Certain animals and plants only live in one place and not the other. The water tastes different – rivers have freshwater and the sea has saltwater.)* Let's keep thinking about the ways that these two places, rivers and the sea are similar and different. Let's do an experiment to see if we can tell the difference between freshwater and saltwater by using our senses.
3. The students will conduct an experiment tasting the difference between the freshwater and saltwater. Each student will be given one tongue depresser and two small paper cups each filled with the appropriate water. One will have A for freshwater and B for saltwater. Have students dip the tongue depresser into Cup A and then place it on their own tongue. This can be done several times until they can feel the water on their tongue. The same procedure will be done for Cup B. As soon as the students finish their sampling, they will complete the following sentence in their journal: **I tasted the two water samples. I think Cup A contains _____ water and Cup B contains _____ water.**
4. Discuss the results of the experiment. Have students describe how freshwater tastes different from saltwater. The students should tell the teacher what they have learned about the taste of the two types of water.
5. Refering back to the large map of Louisiana, have students locate some of the larger rivers in Louisiana (the Mississippi, the Atchafalaya, the Red, Bayou Lafourche, etc.). Have students decide whether they carry freshwater or saltwater. Have students locate the Gulf of Mexico. Does the Gulf of Mexico contain fresh or saltwater?
6. What about the place where rivers meet the sea? Locate Barataria Bay on the map. Is the water here fresh or salty? Or both fresh and salty? Right! The place where the sea and rivers meet is contains a mix of both fresh and salty water! It is a special place called an **estuary**. An estuary is a place where freshwater and saltwater mix. If we look again at the map, we can see at the southern part of Louisiana the Mississippi River and the Gulf of Mexico meet. The two types of waters are mixing and forming an estuary.
7. Have groups of students take a pair of clear plastic cups label one FRESHWATER and the other SALTWATER. Have them put their group names on each plastic cup. Have students measure two tablespoons of freshwater from Cup A and place it in the clear FRESHWATER cup. Have them measure two tablespoons of saltwater from Cup B and place it in the clear SALTWATER cup. Place the clear plastic cups on the window sill and tell students that they will be checking the cups during the next science class.
8. To close today's lesson, the teacher will give each pair the students the blackline master, Fresh or Salty? (**Blackline Master #1**). At their desks, students will locate with their partner where the freshwater is in the state (rivers) and to locate the saltwater (Gulf of Mexico). Put an F next to the water bodies that contain freshwater, an S next to the ones containing saltwater, and an F/S for water bodies that have a mix of salt and freshwater. Have students summarize what they learned from the experiment and about the waters of rivers and the sea.

9. FOLLOWUP. The next science class, have students retrieve their cups from the window sill. Using What's Left Behind? (**Blackline Master #3**), have students record a description of what they find in the cups on their worksheet. Discuss what they found in their two cups. *(Students should find salt crystals/ residue Cup B. There should not be much residue in Cup A – particularly if you used distilled water. When water evaporates, it leaves behind all the dissolved materials, such as salt, sugar, etc., behind.)*

Blackline Masters

1. **Fresh or Salty?**
2. **Fresh or Salty? (Answer key)**
3. **What's Left Behind?**

Assessment

- The teacher will informally assess the students knowledge by their answers.
- The teacher will check the students map to assess whether they can locate the Mississippi River, the Atchafalaya River, and the Gulf of Mexico, as well as whether they have correctly identified fresh, salt and mixed water bodies.

Extensions

Language Arts:

Set up a reading center with several books and magazines related to Louisiana and its habitats. After the students look through the books, they can make puppets and retell the stories. The students should identify whether the books and magazines discuss freshwater and saltwater.

Social Studies:

Set up a felt map of the United States on a wall. The students will put up felt pieces of Louisiana, Gulf of Mexico, and rivers. Students will locate and self check the geography.

Math:

Students can use a paper Louisiana map and count the number of rivers in the state. The students can also use unifix cubes to make a pattern and build a replica of the state.

The Arts:

The teacher will set up butcher paper with modeling clay. The students will make the state of Louisiana and use different colors of clay to add the different types of water.

Resources

Fontenot, Mary Alice. 1985. **Clovis Crawfish and His Friends. (The Clovis Crawfish Series).** Pelican Publishing Company.

In the Louisiana bayou Clovis Crawfish tries to prevent M'sieu Blue Jay from making a meal out of his friend Gaston Grasshopper. Ages 4-8.

Holling, Holling C. 1951. **Minn of the Mississippi.** Houghton Mifflin Company.

This book follows the adventures of Minn, a three-legged snapping turtle, as she slowly makes her way from her birthplace at the headwaters of the Mississippi River to the mouth of river on the Gulf of Mexico. Ages 9-12.

Johnson, Rebecca L. Sept. 2004. **A Journey into an Estuary. (Biomes of North America).** Lerner Publications Company.

Reading level: Ages 9-12.

Peterson, David. 2000. **The Gulf of Mexico. (True Books: Geography: Bodies of Water).** Children's Press.

Reading level: Ages 9-12

Seibert, Diane. 2001. **Mississippi.** HarperCollins.

In a flow of powerful words and images, Siebert invites readers on a poetic journey down America's most famous river: "I am the river,/Deep and strong./I sing an old, enduring song/With rhythms wild and rhythms tame,/And Mississippi is my name." The story moves from the headwaters of the Mississippi River to the Gulf of Mexico. Ages 4-8

Walker, Sally M. 2003. **Life in an Estuary: The Chesapeake Bay.** Lerner Publications Company.

Very informative book on the biology of the Chesapeake Bay estuary.

Blackline Master #1

Name _____

Fresh or Salty?

On the map below locate the following bodies of water:

Mississippi River	Atchafalaya River
Gulf of Mexico	Barataria Bay

Put an F next to the water bodies that contain freshwater, an S next to the ones containing saltwater, and an F/S for water bodies that have a mix of salt and freshwater.

Summarize what you learned today by finishing the following sentence:

I learned that freshwater is different from saltwater because _____
_____.

Freshwater is found in _____ and saltwater is found in _____.
Freshwater and saltwater mix in a place called an _____.

Blackline Master #2

Answer Key

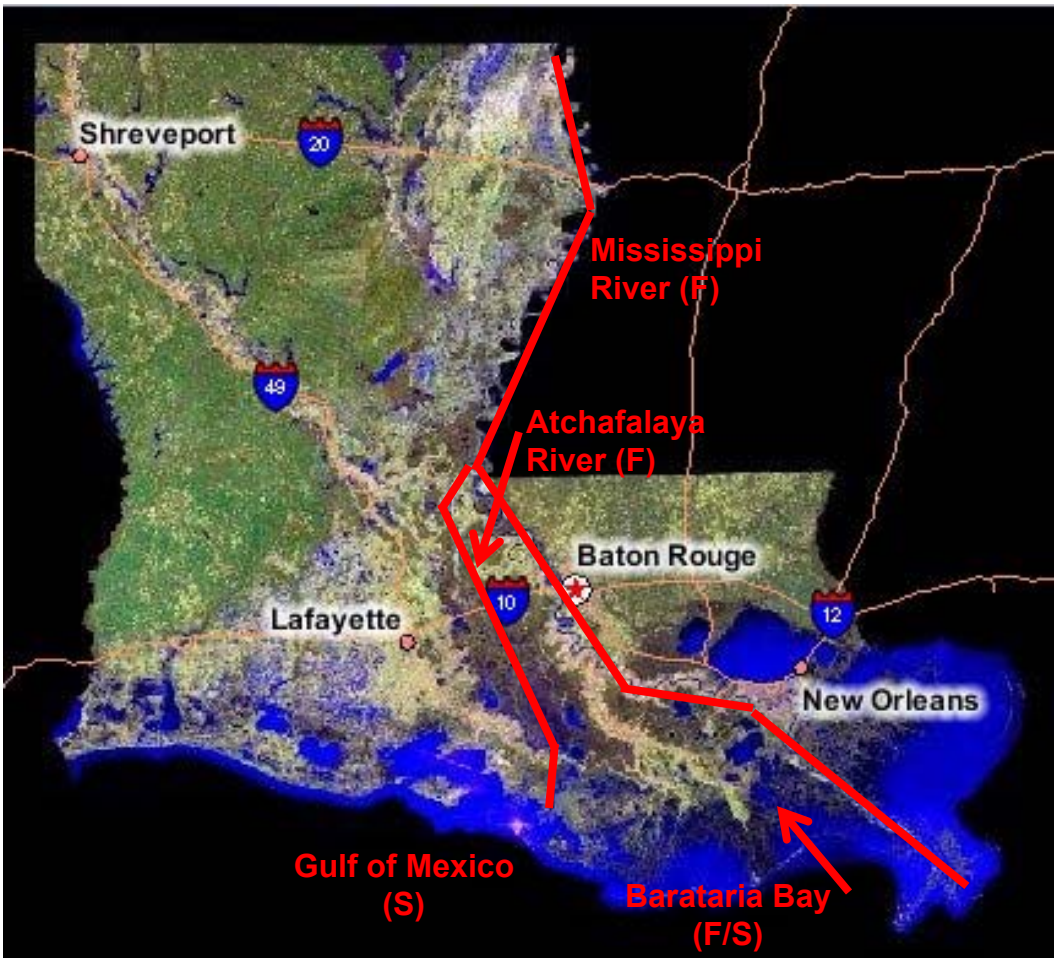
Name _____

Fresh or Salty?

On the map below locate the following bodies of water:

Mississippi River
Gulf of Mexico
Atchafalaya River
Barataria Bay

Put an F next to the water bodies that contain freshwater, an S next to the ones containing saltwater, and an F/S for water bodies that have a mix of salt and freshwater.



Summarize what you learned today by finishing the following sentence:

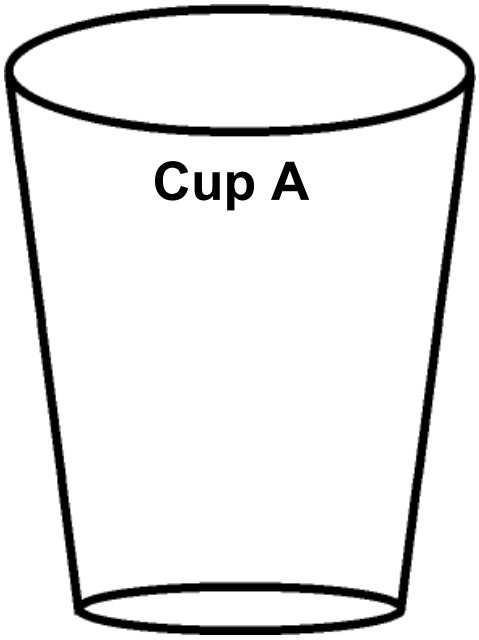
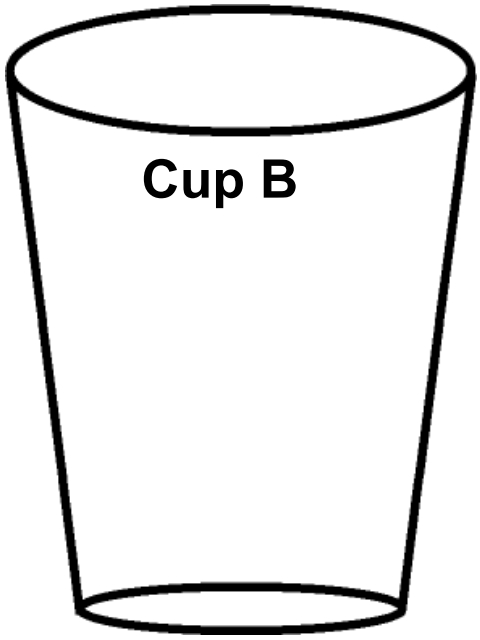
I learned that freshwater is different from saltwater because _____
_____.

Freshwater is found in **RIVERS LAKES AND PONDS** and saltwater is found in **OCEAN AND THE GULF OF MEXICO**. Freshwater and saltwater mix in a place called an **ESTUARY**.

Blackline Master #3

Name _____

What's Left Behind?

What did you put in this cup yesterday? _____ _____ _____	*What did you put in this cup yesterday?* _____ _____ _____
Draw what you see in Cup A below.	*Draw what you see in Cup B below.*
	
Freshwater Cup	*Saltwater Cup*

Summarize what you learned today by describing what happens to saltwater and freshwater that is left in cups evaporates.

_____

_____

_____

_____

Activity 3-2

The Ideal Filter

Adapted from BTNEP/LSU AgCenter: *Functions, Values and Economic Resources*

Focus/Overview

Wetland are one of nature's best filters. This activity challenges students to design an ideal filter by simulating the job done by a wetland in purifying dirty water.

Learning Objectives

The learner will…

- design a filter using a variety of materials and recycled 2-liter drink bottles.
- compete to see whose filter works the best in cleaning dirty water.

Louisiana Grade Level Expectations (Science)

5: GLE-39	Identify areas in which technology has changed human lives (SI-M-B7).
7: GLE 43	Identify and analyze the environmental impact of humans' use of technology (SE-M-A8).

Materials List

Students can bring their own 2-liter bottles and help assemble the variety of materials needed to construct their filtering device.

- empty two liter drink bottles (one per student)
- coffee filters
- soil
- sand, clay, gravel, mud
- dead leaves
- green leaves and/or grass
- small plants
- grass sod
- waterproof markers
- plastic cups
- muddy water (made by mixing clay or mud into water and shaking; 2+ gallons)
- two measuring cups or graduated cylinders

Background Information

Wetlands offer several protective functions to those living within their boundaries: water filtering and purification, storm protection and flood control and erosion control.

Water Filtering and Purification

Wetlands are valuable filters of waterborne pollutants. Today wetlands are used to treat nonpoint source runoff from developed areas and farmland and to further purify partially treated water from sewage treatment facilities. Two of the most valuable functions wetlands perform are the absorption of nutrients and the trapping of sediment carried in water. Wetland plants have an amazing capacity to remove nitrogen and phosphorus from wastewater. This enables farmers to use wetlands to buffer the effects of fertilizer runoff on nearby waterways. Wetlands can also trap sediment running off construction sites, plowed fields, forestry operations, etc. In addition, wetlands can also reduce the concentrations of other harmful chemical pollutants, including pesticides. The removal of these compounds occurs in wetlands through processes including adsorption to sediment clays, chemical processes, and plant uptake.

Advance Preparation

1. Tell students about the challenge several days in advance and ask them to bring in materials from home that they might want to use, including a 2-liter drink bottle.

BTNEP Connection
Water Quality

Grade Level
5, 7

Duration
1-2 class periods

Subject Area
science

Setting
classroom

Vocabulary
water purification, filtering

Original Source
"Weaving Our Wetland Economic Web" in BTNEP/LSU AgCenter: *Functions, Values and Economic Resources*, Activity 11.

www.btnep.org

2. Prepare the 2-liter drink bottles by cutting the top part off to make a funnel and a bottom container. Cut about halfway down the length of the bottle. Make one per student or student group.
3. Numbered squares of paper – one per student.
4. Prepare a large amount of really muddy water (2+ gallons) to test the filters with.

Procedure

1. Review the information found in the Background Section of this activity.
2. You have learned the value of wetlands as natural filters of polluted water. Now you have a challenge activity to try to simulate the filtering capacity of a wetland. Each of you will make a filter and compete to see which does the best job at removing dirt from water.
3. You have all brought in a 2-liter drink bottle, and this will be your apparatus for your filter. I have cut the bottles so there is a top funnel part and a bottom water catching part. We have a variety of materials that you have brought from home and some that I have supplied for this challenge. Your job today is to construct your filtering apparatus. I have already made the muddy water that you will be filtering. (Hold up the muddy water for students to see.)
4. First, each of you will pick a number out of this box. Without showing anyone your number, write it on the bottom of your water catching part of your filtering apparatus. This will identify your filter in the contest.
5. Now you need to work by yourselves to construct your filter in the way you think will filter this dirty water the best. You will have until ____ (time) to finish constructing your filters. (Set a reasonable time limit – long enough to allow students time to complete their filters.) Then you will test your filters, and we'll see whose did the best job of filtering this dirty water.
6. OK. Everyone's finished with their filter. Bring them up to the front desk. I'll mix up the filters so we don't know who they belong to without looking at the number on the bottom of the filters. That way, when you vote for the best filter, your vote will not be *biased* and we will have a fair vote. (Explain bias, if necessary.)
7. I will call you up two at a time to test two of your classmates' filters. Pour the entire muddy water sample I give you into the top part of the filter. (Measure out the muddy water into two measuring cups or graduated cylinders.) When you are done, sit down in your seat. (Let students pour the muddy water into each filter, using the same amount of water each time. Be sure to keep the muddy water sample stirred so that each sample is similarly muddy.) Test all the filtering apparatus.
8. Now we'll decide which filter did the best job. Let's take a look at all the filtered water samples. (Once students have viewed all the samples, let them vote on the sample that looks cleanest. Record their votes on the board.)
9. Now we have a winner. Let's see who it belongs to, and then we'll ask that person to describe how he or she made the filter and what materials were used. (After the student relates this information, discuss with the class why this filter was the most successful. Compare its construction with the composition of a wetland. What are the similarities and differences?)

Blackline Master

none

Assessment

- Students can create a concept map about components of a successful filter and how this is similar to wetland's ability to filter polluted water.

Resources

BTNEP Resources:

Tradebooks:

Olien, Rebecca. 2005. **Making Water Clean**. Capstone Press. 24 pp. ISBN: 0736837035.
Age Range: 6 to 9

Goldman, Linda. 1997. **Cleaning up Our Water**. Scholastic Library Publishing. 96pp. ISBN: 0516055437.
Age Range: 8 to 11

Activity 3-3

The Hurricane's Coming

Adapted from *LA Department of Natural Resources Model and* BTNEP/LSU AgCenter: *Functions, Values, and Economic Resources*

Focus/Overview

Wetlands are one of nature's best filters and protectors. This activity is a demonstration that models the function and value of wetlands in storm protection.

Learning Objective

The learner will…

- model the function and value of wetlands in storm protection.

Louisiana Grade Level Expectations (Science)

8: GLE-28	Use historical data to plot the movement of hurricanes and explain events or conditions that affected their paths (ESS-M-A12).

Materials List

- artificial turf (plastic doormat)
- two large shallow pans or trays
- marbles
- blocks of wood or other objects to raise one end of the pans
- two small model houses (make from wood or Lego blocks)

Background Information

Wetlands offer several protective functions to those living within their boundaries: water filtering and purification, storm protection and flood control and erosion control.

Storm Protection, Flood Control

Coastal wetlands buffer the effects of storms coming ashore. The most damaging effects of a hurricane come from storm surge and high winds. Each mile of vegetated wetlands across which a storm passes reduces the storm surge one foot by absorbing wave energy. This has important implications for the protection of lives and property in the our estuary.

A wetland provides valuable flood protection to human lives and property by acting as a sponge and absorbing excess waters. Unfortunately, some urban development activities have resulted in the draining of wetlands. This has actually created flooding problems in some cases. The floodwater-holding capacity of wetlands is now more often recognized by urban planners, and wetland areas are more likely to be retained as flood buffer zones. In extended dry weather, wetlands also release the store water slowly, reducing the effects of drought in the adjacent areas.

Erosion Control

Wetland vegetation holds the soil in place and prevents erosion. The best example of this is on the banks of waterways where wakes from boats cause erosion and widen the waterways. Planting native plants in high energy areas helps stabilize the shorelines and prevent further erosion. Vegetation planting projects are one of the least expensive methods of wetland restoration. Students can take part in these projects and contribute to the restoration effort

NOTE: This activity is probably best done as a demonstration. The simulation will show how marsh dissipates the energy of a hurricane, while when the storm passes over open water and hits building sitting directly on the shore, it does far more damage. Set the model up before class by cutting the artificial turf material (representing marsh) to fit one tray. The other tray has no marsh, and

BTNEP Connection
Water Quality

Grade Level
8

Duration
1 class period

Subject Area
science

Setting
classroom

Vocabulary
storm protection

Original Source
Adapted from *LA Department of Natural Resources Model and* "The Hurricane's Coming! Your Place or Mine" in BTNEP/LSU AgCenter: *Functions, Values, and Economic Resources*, Activity 12.

BTNEP
BARATARIA-TERREBONNE NATIONAL ESTUARY PROGRAM
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the area represents open water of the Gulf of Mexico. The hurricane is represented by a handful of marbles that roll down the slope of the trays, which are elevated at one end. Place the "house" in the same position, at the bottom end of both trays.

Advance Preparation

1. Cut a piece of Astroturf (or doormat) into a size that fits within the tray you will be using.
2. Have students build two houses out of wood or Legos.
3. Make sure you have enough marbles to run the simulation at the same time in both trays.

Procedures

1. Review the information found in the Background Section of this activity.
2. These two models represent an area of marsh with a house on one side and an area of open water with a house on the shore. The second model could depict the scene after the marsh has eroded away, leaving open water. Suppose there is a strong hurricane approaching with wind of over 100 miles per hour. Which house would you rather be in? The one next to the water, or the one in the marsh? Why? (Ask for two volunteers to release the marbles)
3. Now we are going to simulate the effects of a hurricane. When I say go, release the marbles all at once and let them roll toward the houses. (Volunteers let the marbles go.)
4. What happened? (Students will observe that the marbles had more energy and did more damage when they rolled over the smooth tray surface, as opposed to over the rough turf, or marshy area. Adjust the slope, number of marbles and other variables to give the best effect. You can repeat the demonstration and let other student volunteers release the marbles.)

Blackline Master

none

Assessment

- Students can create a concept map about the protective nature of the marsh during storms.

Resources

BTNEP Resources:

Tradebooks:

Simon, Seymour. 2003. **Hurricanes**. HarperCollins Children's Books. 32pp. ISBN: 0688162916

Discusses where and how hurricanes are formed, the destruction caused by legendary storms, and the precautions to take when a hurricane strikes. Age Range: 3 to 8.

Sherrow, Victoria. 1998. **Hurricane Andrew: Nature's Rage**. Enslow Publishers, 48 pp. ISBN: 0766010570

Details the course of Hurricane Andrew, which hit the southeastern United States in 1992, and describes the recovery efforts that followed the storm. Age Range: Young Adult.

Dixon, Dougal. 2004. **Hurricane Destruction**. School Specialty Children's Publishing. 32pp ISBN: 1577688686

A brutal hurricane season has just begun in the Caribbean. Follow a young journalist as he joins meteorologists preparing for the storm by plotting the path of anticipated destruction. Will they and the town get blown away in the storm? Age Range: 7 to 11.

CDs

Louisiana Wetland Functions and Values CD developed by LSU AgCenter's Extension Service in conjunction with the U.S. Geological Survey's National Wetlands Center and the Louisiana Department of Natural Resources (DNR). To receive a copy, contact DNR (800/ 267-4019) or order on the Internet at http://www.lacoast.gov.

References:

Longshore, David. 2000. **Encyclopedia of Hurricanes, Typhoons and Cyclones**. Facts on File, Inc. 372pp. ISBN: 0816042918.

Over 200 entries cover hurricanes in science, history and culture, and folklore, including how storms have appeared in literature, music, and the visual arts. For many of the storms described, the author provides maps of their course, detailed chronologies of their progress, photographs of their aftermath, and comments about them from firsthand observers. Topics covered include meteorological terms, geographical terms, and methods of hurricane tracking and data analysis. Other entries: meteorological instruments; named storms; descriptions of storm activity by region; meteorological terms, and the role of animals as harbingers of weather to come.

Activity 3-4

Keep It Above Board

Deborah Schultz

Focus/Overview

This activity focuses on trash decomposition in the environment. Students explore the length of time it takes for various common materials to decompose in the environment. Discussion brings out the point that some human actions, like littering, can be very harmful to the animals and plants that live within our ecosystems.

Learning Objectives

The learner will…

- develop a decomposition timeline illustrating how long it takes for various types of common trash to deteriorate in the environment.

Louisiana Grade Level Expectations (Science)

2-4: GLE-1 (Inquiry)	Ask questions about objects, organisms and events in the environment (SI-E-A1).
2-4: GLE-4 (Inquiry)	Predict and anticipate possible outcomes (SI-E-A2).
2: GLE-49	Describe how consumption of resources can be reduced by recycling, reusing and conserving (SE-E-A4).
3: GLE-58	Describe how humans have made negative and positive affects on organisms and their environments (SE-E-A5).

BTNEP Connection
Water Quality

Grade Level
2-4

Duration
1 class period

Subject Area
science

Setting
classroom

Vocabulary
decompose, ecosystem, decomposition, environment

Original Source
Author: Deborah Schultz

www.btnep.org

Materials List

- BTNEP 2005 Tidal Graph Calendar Month of April trash chart (available on the BTNEP Resources page of the website www.btnep.org)
- Roll of poster board paper or other paper roll to create timeline
- Yardstick
- Markers
- Photocopy of page, with individual items cut out
- Objects from calendar (or something made of same material)
  - paper towels
  - apple core
  - cotton glove
  - newspapers
  - cardboard box
  - waxed milk carton
  - cotton rope
  - disposable diaper
  - Styrofoam float
  - stick
  - monofilament fishing line
  - glass jars or bottles
  - Styrofoam cup or plate
  - aluminum cans
  - plastic bottle
  - wool glove
  - plywood
  - tin can
  - plastic six-pack ring
  - tire
  - orange peel
  - shirt

Background Information

Waste materials degrade at different rates. This activity will provide students with an opportunity to learn about the length of time materials last in the environment. As students make timelines, be sure to have them include the following: 400 B.C. - Greeks develop the first town dumps, 1769- Thomas Jefferson builds Monticello and includes a mechanical garbage disposal system, 1785- the first cardboard box is produced, 1961- Proctor & Gamble begin test-marketing disposable diapers.

Advance Preparation

1. Collect materials pictured on the **Keep It Above Board Trash Chart - Blackline Master #1** (from the BTNEP Tidal Graph Calendar. *NOTE: A "tidal graph" is a graph that shows the height of the sea's surface at a particular time and place on the coast. The tides are of particular interest to fishermen and boaters. You can download a copy of the BTNEP Tidal Graph Calendar at http://www.btnep.org.*

Procedure

1. Begin by asking students, "What does **decompose** or **decomposition** mean? Write the student responses on the board.
2. Divide students into groups. Have students take the materials you provide them and place them in (predict) what they think is the relative order of decomposition. Have students record their agreed upon order in each group. Compare the groups' orders. Are their differences? If so, why? Get a consensus from the class on how long each item takes to decompose and put the objects in order. Start with the item that takes the least amount of time to decompose and end with the item that takes the most time. Record your final order.
3. Have students examine the BTNEP Tidal Graph Calendar chart that shows the decomposition rates of the various items. How does the consensus (class) list compare with the actual decomposition times? Remind students that without air (as in the case of a landfill, items decompose at a much slower rate.
4. You can extend the activity by (1) having students create a collage of pictures to show the relative order of decomposition, or (2) giving students pictures of objects not listed in the calendar chart and have them predict the decomposition time based on materials already on their timeline.
4. Ask the students, "What does this information tell us about litter and waste?" Have the groups of students summarize what this display of trash data means in their own words. Have each of the groups share what they understand with their classmates.
5. Conclude by discussing the following questions:
    - Is it OK for us to litter with any of the items on the list? Why or why not?
    - What kinds of items take the longest to decompose?
    - What kinds of items take the least amount of time to decompose?
    - Which of the items on our list could be recycled?
    - Why is recycling good for our environment and the Earth?

Loose leaf paper – 2-4 weeks
Banana peel – 2-5 weeks
Newspaper – 6 weeks
Apple Core – 2 months
Cardboard Box – 2-3 months
Cotton Glove – 3 months
Waxed Milk Carton – 5 months
Wool Sock – 1 year
Plastic Garbage Bag – 10-20 years
Painted Wood – 13 years
Nylon Fabric – 30-40 years
Styrofoam Cup – 50 years
Rubber Boot Sole – 50-80 years
Tin Can – 100 years
Aluminum Can – 200-500 years
Plastic Cup – 250 years
Six Pack Ring – 400 years
Plastic Bottles – 450 years
Disposable Diaper – 500 Years
Glass Bottles – Undetermined
Plastic Bottles – Undetermined

Blackline Master

1. **Keep It Above Board Trash Chart**

Assessment

- Students can create a concept map about the protective nature of the marsh during storms..

Resources

BTNEP Resources:

- BTNEP Tidal Graph Calendar.

Tradebooks:

Brimner, Larry Dane. 2003. **Trash Trouble** (Rookie Choices Series). Children's Press. 32pp.

On a field trip to the Nature Center, Three J leads his second-grade classmates on a mission to pick up as much trash as possible after they find a bird caught in a discarded lunch bag. Age Range: 6 to 7.

Jacobs, Francine. 1996. **Follow That Trash: All about Recycling.** Penguin Group (USA). 48pp.

With this amusing and educational book, readers can follow the trash and find out how soda cans can turn into a canoe. Using simple text and clever cartoon-style drawings, Follow That Trash! teaches children where all that garbage goes. Full color. Age Range: 6 to 8.

Schwartz, Linda. 1990. **Earth Book for Kids: Activities to Help Heal the Environment.** Creative Teaching Press, Inc. ISBN: 0881601950.

Creative ideas with easy-to-follow instructions show kids how to make their own paper, compare phosphate levels in detergents, test the effects of oil pollution, conduct a recycling survey, create a trash sculpture, redesign a package, chart a flush, measure acidity and make a difference in many other exciting ways. Age Range: 8 to 11.

Sensel, Joni. 2001. **Garbage Monster.** Dream Factory Books. 24pp. ISBN: 0970119526.

When Jo is slow to take out the trash one evening, the garbage comes to life and hauls her outside instead. The beast threatens mayhem throughout the neighborhood, but Jo is undaunted. She plucks him limb from limb, finding another use for his cardboard head, fibrous fanny, & other various parts. By the time she is done, Jo sees how recycling can be a resourceful way to put the beast back in his place-and make an unpleasant chore more fun. This book brings to life the benefits of recycling and the hazards of a wasteful attitude. Age Range: 5 to 8.

Stwertka, Eve, and Albert Stwertka. 1993. **Cleaning up: How Trash Becomes Treasure.** Silver Burdett Press. 40pp. ISBN: 0671694677.

Discusses the problem of trash and what can be done with it, including the partial solution of recycling. Age Range: 7 to 10.

Websites:

Videos

Trash and the Environment (Real World Science 1 series). 1999. Sunburst Communications. Cost: $49.95 (includes 13 minute video with teacher guide and 25 student worksheets). Contact Sunburst Visual Media, (800) 431-1934, http://www.sunburstvm.com/

This videotape, designed for students in grades 3 to 5 as part of the REAL WORLD SCIENCE I series, explores what happens to trash, litter, and solid waste after it is thrown away. Viewers listen to student host, Cassie, as she describes Earth's natural recycling process and explains how humans have altered this process. Color photographs and footage highlight the ways in which humans produce solid waste from lunch bags and leftover food to worn out socks and homework mistakes. The processes of reducing, reusing, and recycling are also addressed. Age Range: 8 to 10 years.

BTNEP 2005 Tidal Graph Calendar
Month of April - Trash Chart

Activity 3-5

Exploring the Barataria-Terrebonne Watershed

Adapted from BTNEP/LSU AgCenter: *Nonpoint Source Water Pollution*

Focus/Overview

This activity draws a contrast between the relatively flat landscape of coastal Louisiana to more hillier terrain in the Tunica Hills region. This opens the discussion for how water moves through watersheds.

Learning Objectives

The learner will…

- become familiar with the geography of their community in relation to the watershed.
- examine topographical maps of their community in relation to the watershed.
- locate and mark their homes, school, waterways, sewage treatment plant and any industrial plant on the topographic map.
- make observations about the watershed patterns and the locations of the various features.

Louisiana Grade Level Expectation (Science)

8: GLE-21	Read and interpret topographic maps (ESS-M-A9)

Materials List

- Topographic maps covering your community - one per group; available from Louisiana Geologic Survey or download small sections from Topozone or Terraserver (see web references)
- Aerial photograph of your community and/or region (available online at Terraserver (see web references), or at sporting and fishing suppliers or the U.S. Department of Agriculture, Farm Service Agency or National Resources Conservation Service office)
- Map or satellite image of the Barataria-Terrebonne National Estuary (available from BTNEP)
- Colored pencils or crayons
- Sample topographic map from a hilly area, like the Tunica Hills of Louisiana.
- Photograph showing the flat wetland topography of Barataria-Terrebonne and a photograph of a hilly area.

BTNEP Connection
Water Quality

Grade Level
8

Duration
1-2 class periods

Subject Area
science

Setting
classroom

Vocabulary
watershed, tributaries, delta plain, distributaries, aerial view, contour lines, drainage basin

Original Source
"Exploring the Barataria-Terrebonne Watershed" in BTNEP/LSU AgCenter: *Nonpoint Source Water Pollution*, Activity 1.

BTNEP Barataria-Terrebonne National Estuary Program
www.btnep.org

Advance Preparation

1. Locate all the map products. If you have the funds to provide a map/image set to each group, laminate the products if possible. If funding constraints prevent this, get one map and copy the most relevant part of the watershed for the students.

Background

Hydrology is the study of the movement of water over and through the land. The hydrology of Barataria-Terrebonne is complex. Here, the fresh water draining from the land and the salty water of the Gulf of Mexico meet and mix together in vast expanses of coastal marshland. The hydrology of a coastal marsh is controlled by the interaction between tides, winds and rainfall. In Barataria-Terrebonne, the tidal range is low but a strong northerly wind can push the water out into the Gulf, causing very low water conditions

in the marsh. A strong south-easterly wind can push water into the estuary, resulting in increased salinities, very high water conditions and flooding.

The Barataria-Terrebonne estuary is divided into two drainage basins: The Barataria Basin and the Terrebonne Basin. The terms basin and watershed are interchangeable, although a watershed is usually considered a sub-unit of a larger basin.

A drainage basin is all the land area draining into a main waterbody, which can be a river, lake or sea. In the case of the Barataria-Terrebonne basins, the main receiving waterbody is the Gulf of Mexico. Water flows over the land and is channeled into waterways, which in the Barataria-Terrebonne, are natural bayous and man-made canals. The water flows through these waterways to the Gulf of Mexico.

The Barataria watershed (or basin) and the Terrebonne watershed (or basin) are separated by Bayou Lafourche. The Terrebonne watershed has several waterways that drain to the Gulf of Mexico. These include Bayou Terrebonne, Bayou Pointe Aux Chenes, Bayou Petit Caillou, Bayou Grand Caillou and Bayou Dularge. Some water from the Atchafalaya River also flows through the Terrebonne watershed via the Intracoastal Waterway and enters the Gulf through Four League Bayou. The Barataria water is drained by Bayou Des Allemands, Bayou Barataria, Bayou Perot and Rigolettes. Bayou Lafourche is the chief waterway and was the main distributary of the Mississippi River when the land in Barataria-Terrebonne was built. These are all examples of natural waterways that drain these basins. Small and large man-made waterways in both watersheds are also involved in the drainage system.

In the Terrebonne watershed, the Houma Navigation Canal is a deep navigation channel that connects the Intracoastal Waterway with the Gulf of Mexico. In the Barataria watershed, the Barataria Waterway does the same thing. Many small canals crisscross the landscape of both watersheds, complicating the waterflow patterns.

Long ago, before the flood control levees were put in place on the Mississippi River and the connection between the Mississippi River and Bayou Lafourche was dammed, Mississippi River water flowed through the Barataria-Terrebonne marshes during spring high water, nourishing the marsh with nutrients and sediment. Today the water flow from the Mississippi to Bayou Lafourche is carefully controlled so the marshes of Barataria-Terrebonne receive little fresh water and sediment. Rainfall represents most of the drainage within the Barataria-Terrebonne drainage basins today.

Procedure

1. We are going to investigate where water travels in our watershed and some of the pollutants that can be found in water. What is a watershed? *Allow time for students to brainstorm a definition.* A **watershed** is the area of land that catches rain and snow and drains (or seeps) into a marsh, stream, river, lake or groundwater. Watersheds can be large or small. The Barataria-Terrebonne Estuary is made up of two large watersheds. Both of these watersheds are within the larger watershed of the Mississippi River.
2. About 40% of the United States is within the huge Mississippi River watershed. The Mississippi River has the third largest drainage basin in the world, exceeded in size only by the watersheds of the Amazon River and Congo River. It drains 41 percent of the 48 contiguous states of the United States. The basin covers more than 1,245,000 square miles, including all or parts of 31 states and two Canadian provinces. *Display the Mississippi River watershed map,* ***Blackline Master #1.*** The small branches on the map represent all the small rivers and streams draining to the larger rivers. The larger rivers drain into the main water body, the Mississippi River. The rivers that drain into the Mississippi are all **tributaries** of the Mississippi River.
3. *Display a transparency/map/satellite image of the Barataria-Terrebonne watershed,* ***Blackline Master #2****.* This is the Barataria-Terrebonne watershed. It is an unusual watershed because the land it drains was created by the Mississippi River. It is part of the Mississippi River **delta plain**. When the Mississippi River built the land that is now Louisiana, its flow was divided into many smaller branches as it approached the Gulf of Mexico. Many of the waterways in our watershed are, or once were, branches of the Mississippi River. These branches, which carry river water out of the Mississippi River, are called **distributaries**. They distribute water from the main river to the Gulf of Mexico. Now let's think – what distinguishes tributaries from distributaries? *(Demonstrate on the transparency or map that tributaries bring water into a larger river, while distributaries drain water out of a larger river into smaller rivers and streams.)*

4. *Pass out the topographic maps (one local map and one from a hilly area – **Blackline Masters #3 and #4**) to each student group.* We'll look at some maps and photographs to become more familiar with the Barataria-Terrebonne watersheds. A map is an **aerial view** of the land. Modern maps often are made from aerial photographs. Maps and aerial photographs can tell us a great deal about the land. The most detailed maps are called topographic maps. They are useful for studying the watershed because they show elevation, or the height of the land above mean sea level. In the Barataria-Terrebonne watershed, we have very small differences in elevation. In other watersheds, there may be great differences in elevation. In other watersheds, there may be great differences in elevation.
5. This is a topographic map of our community (or you can use **Blackline Master #4 – Topographic Map of Pierre Part, Louisiana**), and here is a topographic map of another location which looks very different from ours (**Blackline Master #3 – Topographic Map of Brandon, Louisiana**). What differences can you see between the two maps? (Close contour lines are found on the hilly map and indicate steep terrain. The contour lines on the local map are far apart, indicating a flatter landscape.)
6. Here are two photographs (**Blackline Masters #5 & #6**), one of our area and the other one of the second location. Can you see how the map sows the slopes of the hills with the contour lines? The closer together the contour lines are, the steeper the hills. In Barataria, do we have any steep hills? Do we have any hills at all? How would you describe the landscape here? Are there contour lines on the map of Barataria-Terrebonne?
7. Let's look closely at the map of our area. Try to find the features and waterways we know and follow the path of water as it drains through the watershed. On your copy of the map, locate our school and your own home if you can find it. Label the school and your home. *(The contour lines run parallel with the bayous, indicating the high ground of the ridge along the bayou. Some artificial levees may show these parallel contour lines, too.)*
8. Now we will find the high ground and low ground areas. In our watershed there is not much high ground. Where do we find the high ground in our community? *(The high ground is on the banks of the bayous. This is a key concept in south Louisiana and has shaped the students' families' history, culture and heritage.)* Let's try to find some contour lines on the topographic map. Look carefully for small brown (on the original map) lines that run next to each other in parallel rows. Try to locate a number on a contour line. Raise you hand when you find one. This tells us how many meters (or feet, depending on the map) above mean sea level this point is. Look for the largest of these numbers on the map. This is the highest contour. Draw a red circle around the number on the photocopy of the map. Look for the smallest of these numbers on the map. This is the lowest contour. Put a green circle around the number on your copy.
9. When it rains, what happens to the water that falls on the ground? *(It runs downhill or toward a lower elevation.)* Now take a blue pencil and trace the path of each waterway on the photocopy of your topographic map. What do you observe about the patterns made by the waterways? Where is the lowest point in the contour pattern? Where is the highest contour in the pattern? Does the water always flow toward the Gulf of Mexico? *(Much of Barataria-Terrebonne is at sea level. The water may not flow toward the Gulf all the time. Tides and wind will bring water from the Gulf up the bayous. This is a concept the students will often be aware of, especially in fishing families.)*
10. Locate the following features on your topographic map. When you find one, mark it with a red X.
    - Sewage treatment plant
    - Industrial plant or factory
    - Farm (what crops/animals are grown here?)
    - Seafood packing or processing plant
    - Car wash
    - Gas station

    What other features can we identify on our maps? Can you predict how some of the features may affect the water in our watershed?

Blackline Masters

1. **Mississippi River Watershed**
2. **Barataria-Terrebonne Watershed**
3. **Topographic Map of Brandon, Louisiana**
4. **Topographic Map of Pierre Part, Louisiana**
5. **Aerial Image of Brandon, Louisiana**
6. **Aerial Image of Pierre Part, Louisiana**

Assessment

- Ask students to contrast the two regions, coastal Louisiana and Tunica Hills, with regard to topography and watersheds.
- Give students a map of the United States showing all major rivers and have students encircle the Mississippi River watershed.

Resources

BTNEP Resources:

Portrait of an Estuary, publication by LSU AG and BTNEP

Websites:

Earthtrends, World Resources Institute, 2005, **Watersheds of the World: North and Central America - Mississippi Watershed**, accessed July 11, 2005, at http://earthtrends.wri.org/maps_spatial/maps_detail_static.cfm?map_select=390&theme=2.

Nice map of the Mississippi River watershed.

Terraserver Website, accessed July 13, 2005, at http://www.terraserver.com

Excellent website to locate and download maps and aerial images of specific locations anywhere in the USA..

Topozone Website, accessed July 13, 2005, at http://www.topozone.com

Excellent website to locate and download topographic maps anywhere in the USA..

References:

USGS Topographic Map website, April 28, 2005. Accessed July 13, 2005 at http://erg.usgs.gov/isb/pubs/booklets/symbols/.

Information on reading and interpreting topographic maps.

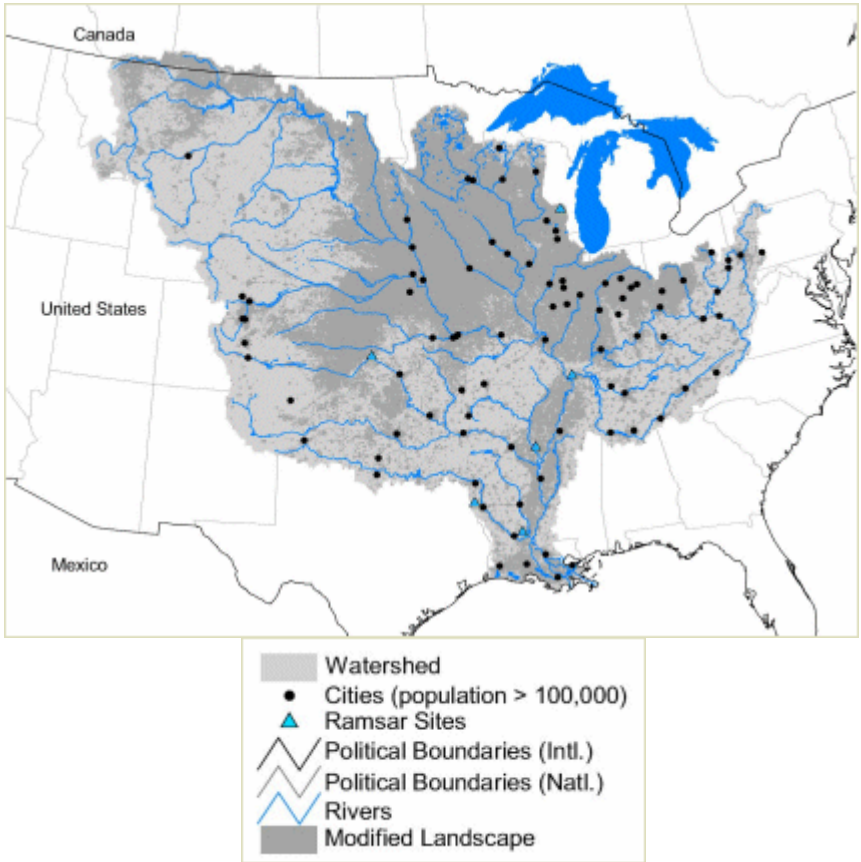
About.com website. 2005. **How to read a topographic map**, accessed July 13, 2005 at http://geography.about.com/library/howto/httopo.htm.

Simple steps to topographic map interpretation. Related links.

Blackline Master #1

Mississippi River Watershed

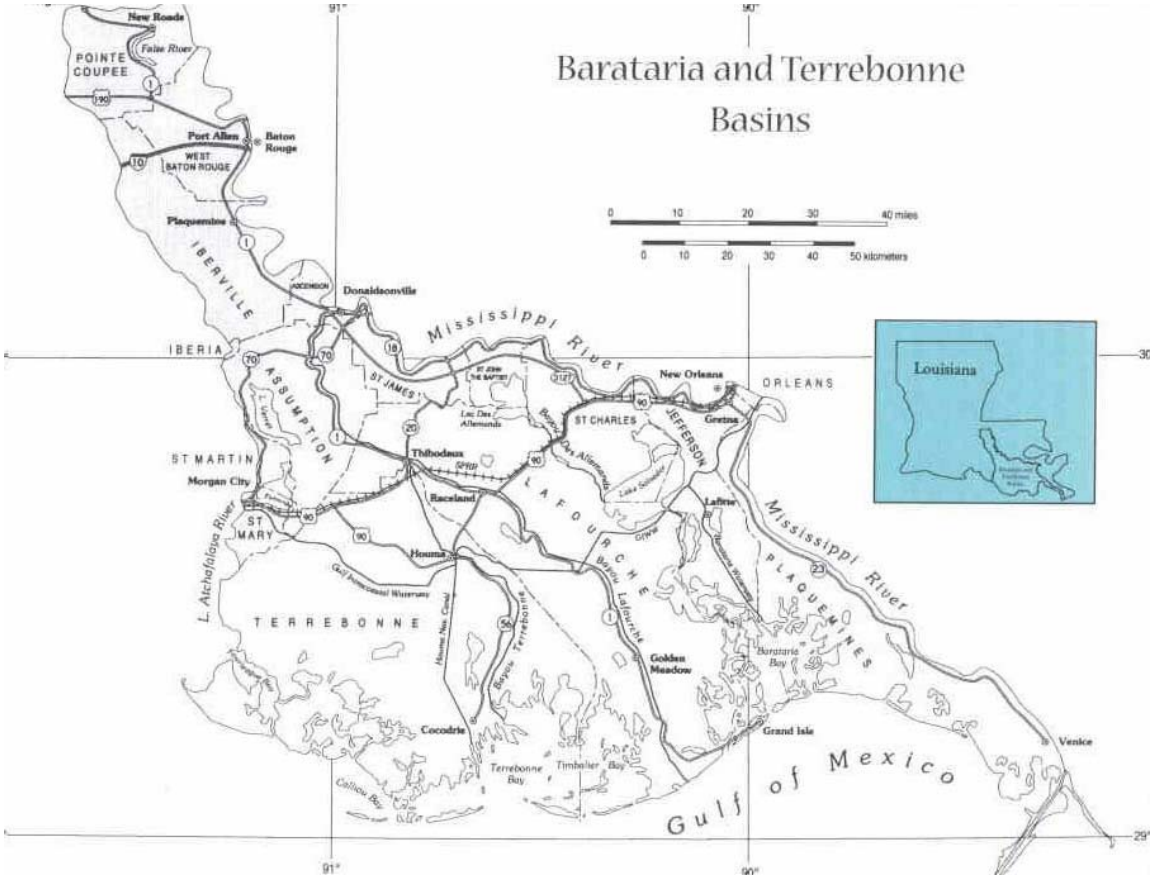
http://www.epa.gov/msbasin

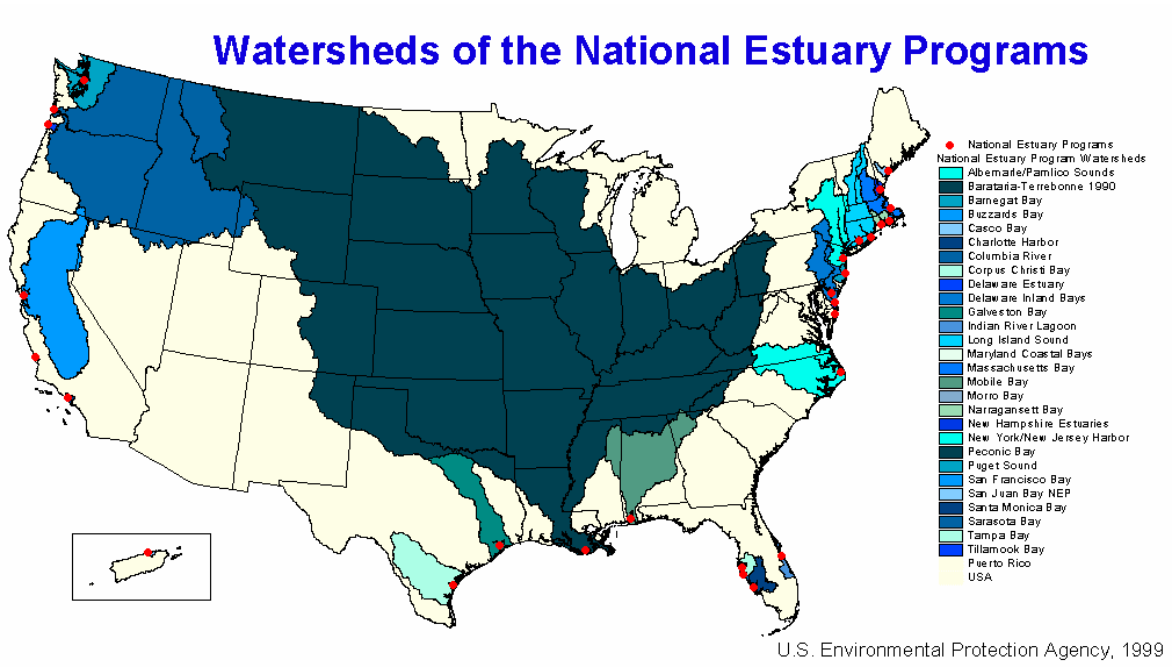


http://earthtrends.wri.org/maps_spatial/maps_detail_static.cfm?map_select=390&theme=2

Blackline Master #2

Barataria-Terrebonne Watershed





Blackline Master #3

Topographic Map of Brandon, Louisiana

Located in the Tunica Hills of Southeast Louisiana. The blue area in the lower left corner of the map is one of the meander bends of the Mississippi River

62 km NE of Baton Rouge, Louisiana, United States 7/1/1994

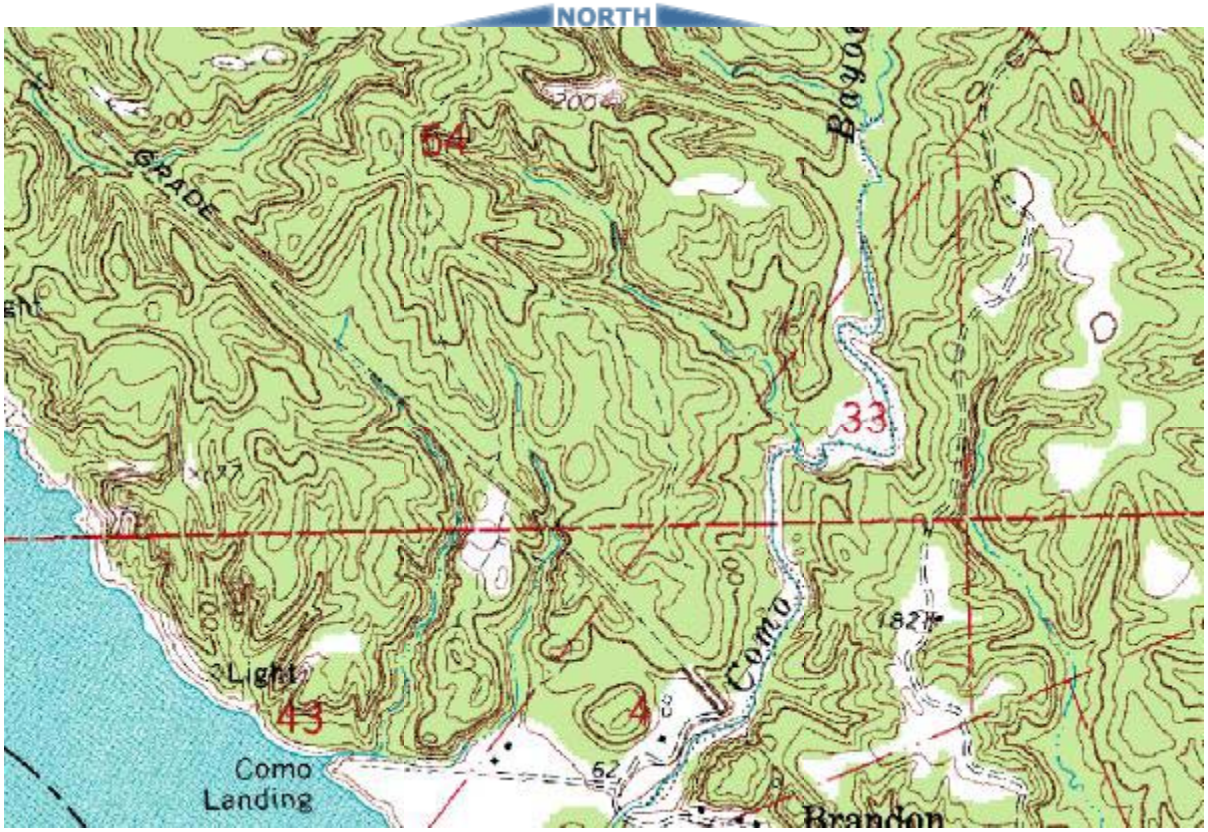


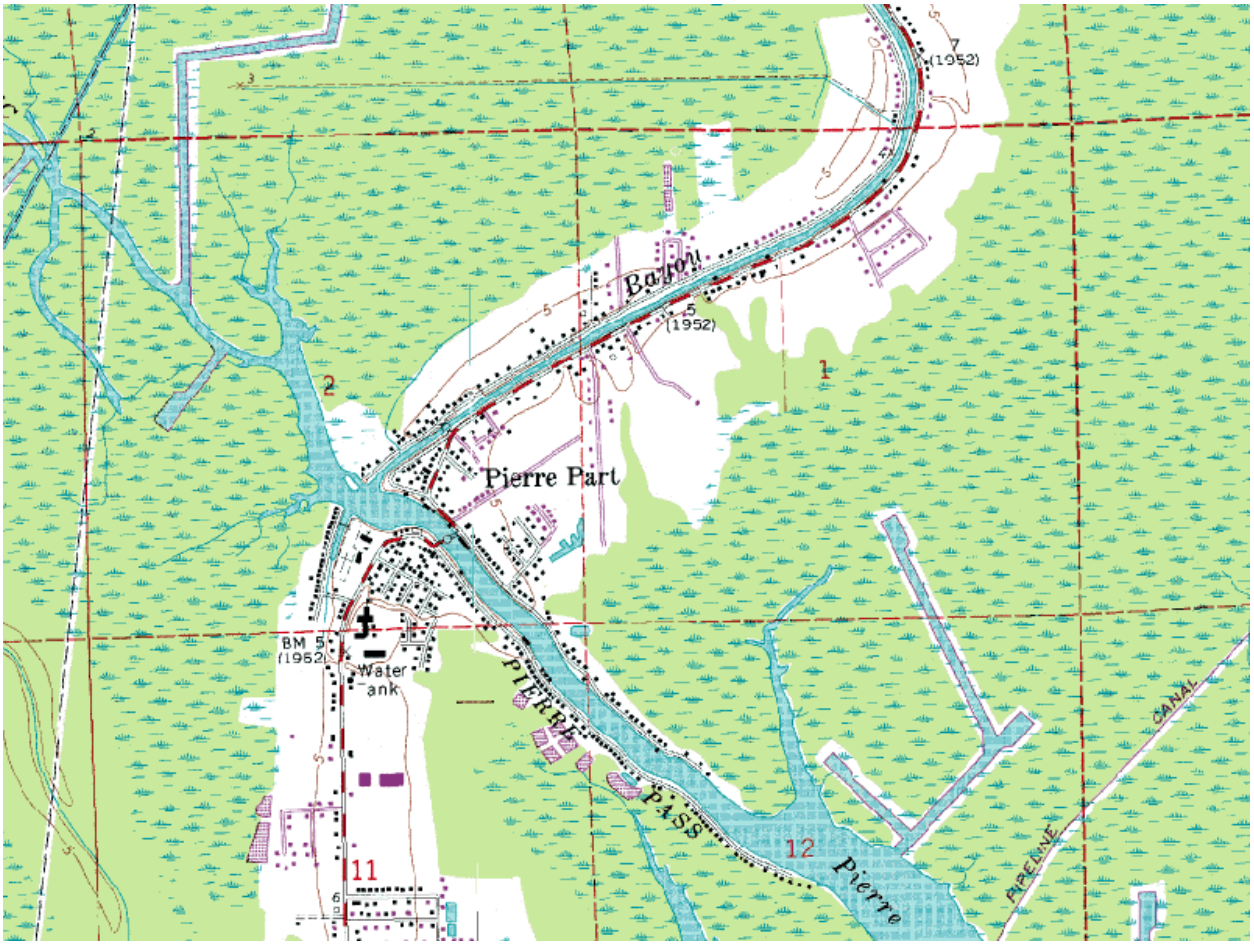
Image courtesy of the U.S. Geological Survey

USGS **Angola** Quad
UTM 15 642228E 3421359N (WGS84/NAD83)
Latitude: 30.9ºN Longitude -91.5ºW

Blackline Master #4

Topographic Map of Pierre Part, Louisiana

Located just east of the guide levee of the Atchafalaya River and north of Morgan City.



topozone
Copyright 1999-2003 Maps a la carte, Inc.

Image courtesy of U.S. Geological Survey.

0 0.7 1.4 2.1 2.8 3.5 km
0 0.4 0.8 1.2 1.6 2 mi

USGS **Pierre Part** Quad
UTM 15 673375E 3316288N (WGS84/NAD83)
Latitude: 29.96ºN Longitude -91.2ºW

M=1.362
G=0.898

Blackline Master #5

Aerial Image of Brandon, Louisiana

Located in the Tunica Hills of Southeast Louisiana. The blue area in the lower left corner of the map is one of the meander bends of the Mississippi River

62 km NE of Baton Rouge, Louisiana, United States

↑ NORTH

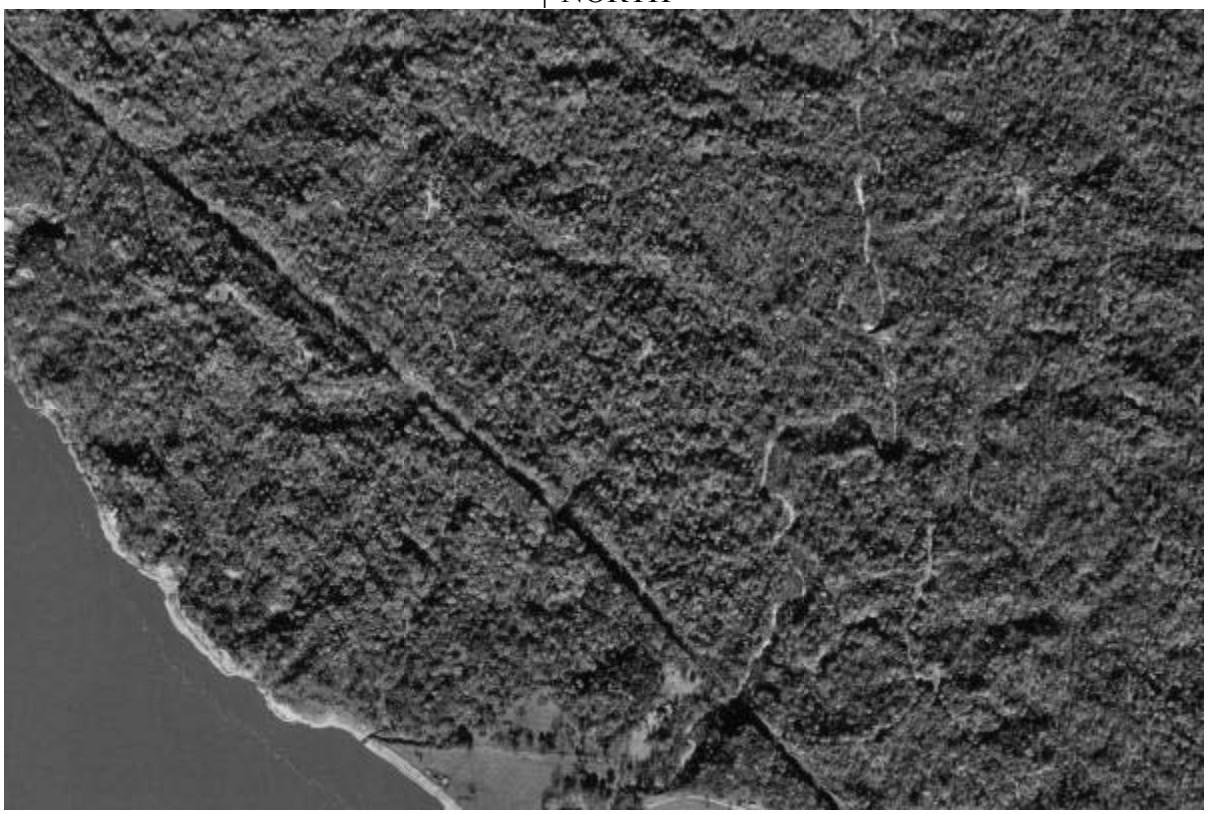


Image downloaded from Terraserver.com. Image courtesy of the U.S. Geological Survey

Blackline Master #6

Aerial Image of Pierre Part, Louisiana

Located just east of the guide levee of the Atchafalaya River and north of Morgan City.

↑ NORTH

Photo array taken 2/21/1998

Image downloaded from Terraserver.com. Image courtesy of the U.S. Geological Survey

Activity 3-6

Watershed Drainage and Sources of Pollution

Adapted from BTNEP/LSU AgCenter: *Nonpoint Source Water Pollution*

Focus/Overview

This activity draws a contrast between the relatively flat landscape of coastal Louisiana to more hillier terrain in the Tunica Hills region. This opens the discussion for how water moves through watersheds.

Learning Objectives

The learner will…

- make a model watershed using simple inexpensive materials.
- use the model watershed to investigate runoff, point source, and nonpoint source pollution.

Louisiana Grade Level Expectations (Science)

5: GLE-50	Describe the consequences of several types of human activities on local ecosystems (e.g. polluting streams, regulating hunting, introducing nonnative species) (SE-M-A4).
7: GLE-39	Analyze the consequences of human activities on ecosystems (SE-M-A4).
8: GLE-50	Illustrate possible point and nonpoint source contributions to pollution and natural or human-induced pathways of a pollutant in an ecosystem (SE-M-A3).

BTNEP Connection
Water Quality

Grade Level
5, 7, 8

Duration
2-3 class periods

Subject Area
science

Setting
classroom

Vocabulary
watershed, point source pollution, nonpoint source pollution.

Original Source
"Create Your Own Watershed" and "What is Runoff?" in BTNEP/LSU AgCenter: *Nonpoint Source Water Pollution*, Activities 2 & 3.

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

Materials List

- large piece of plastic sheet
- powdered cocoa mix
- colored drink mix powder (red and green)
- watering can with sprinkler on spout or large water spray bottle
- water supply
- sponges or cloths for cleanup
- a variety of objects to place beneath plastic cloth to create contours
- toy tractors, trees, animals, cars, buildings
- map or aerial photograph of Barataria-Terrebonne watershed
- materials for simulating different landscapes (wetlands, residential areas, agricultural land)

Advance Preparation

1. Spread plastic cloth on a large, flat surface, either inside or outside. Have materials for mopping up water on hand and containers for holding water.
2. Fill spray bottle and/or watering can
3. Prepare the "pollutants."
   a. Cocoa powder can be soil
   b. Cocoa/water mixture in a spray bottle - can be used oil, point sources pollutants
   c. Cocoa paste can be cow manure
   d. Red drink mix powder can be pesticides; green drink mix powder can be fertilizers.
4. Collect props for the watershed, including:
   a. Industrial site
   b. Sewage treatment plant – a small bowl can represent the clarifier tanks.

Background

Water pollution is divided into two categories according to its source. Point source pollution, as its name suggests, come from a specific point, such as a pipe. We can trace the source of such pollution, and therefore it can be controlled. The Clean Water Act Amendments of 1972 have gone a long way to address point source pollution by imposing regulations on industries, sewage plants and other facilities that discharge wastes into water. There is a complex permitting and enforcement process overseen by the U.S. Environmental Protection Agency (EPA) and the Louisiana Department of Environmental Quality.

If you choose to use an Enviroscape for this lesson, it will demonstrate three examples of point source pollution: a factory, a sewage treatment plant and a residential storm drain system. The latter receives nonpoint pollution - runoff from city streets – but the discharge from the drain itself may be classified as point source pollution.

Nonpoint source pollution comes from many widely scattered sources. These include our own lawns and streets, as well as farms, forests, construction sites, parking lots, and oil and gas extraction facilities. The sources of nonpoint source pollution are difficult to identify, making it much harder to control nonpoint source than point source pollution. The table outlines the causes and effects of nonpoint pollutants.

Nonpoint Source Pollutants

Source location	Pollutant	Potential Effects
Farms, residential lawns and gardens, parks, golf courses, school grounds	soil/sediment	turbidity in water, affecting aquatic life, clogging culverts and drainage ditches and carrying pollutants attached to soil particles.
	fertilizers	nutrient overload, which can cause excessive growth of aquatic vegetation (such as algae)
	pesticides	toxicity
	livestock, wildlife and pet wastes	nutrient overload, pathogens
Forestry operations, construction sites, roads, parking lots, driveways, gas stations, airports, industrial sites	soil/sediment	turbidity
	soil, grease, antifreeze, spilled fuel, solvents	accumulation of organic chemicals in water bodies, oil slicks on water surface, toxicity

Procedure

1. Let's review the definition of a watershed. (An area that is drained by a single body of water.) Let's look at the Barataria-Terrebonne Estuary again. *Display the Barataria-Terrebonne satellite image map.* Remember, Barataria-Terrebonne is made up of two watersheds or drainage basins. *Locate the two watersheds on the image.* We are going to make a watershed model. It doesn't have to be exactly like the Barataria or the Terrebonne watershed, but we can simulate how water drains from our watershed.
2. We have a large piece of plastic laid out on the floor (or ground). Now we need to make some topography, or changes in ground elevation. How can we use some of the objects I have here to change the elevation in the watershed? *Students suggest ways to create topography and put the objects under the plastic sheet to simulate the contours of part of the Barataria or Terrebonne watersheds.*
3. Before we add water to this watershed, where do you think the water will go? *If the water will run off the plastic, then assign students cleanup duty to take care of the spills. Using the water cans or spray bottles, rain on the watershed and have students notice whether predictions of where the water would travel were correct.*
4. Now we'll add other features to the landscape. We have collected cars, tractors, animals, trees and buildings, and we need to add them in appropriate places to complete our landscape. *Use thin sponges to represent marshes in appropriate locations.* What are the different uses we put the land to? A lot of the land is wetlands, but there are urban areas and agricultural areas. What can we add to the landscape to simulate these land-use types? *Other land-use types can be delineated by using permanent markers and coloring them in. Try to keep this simple, so the watershed effect will still work will still work when you add water.*

5. *At this point you may wish to review the water cycle or hydrologic cycle. See Project WET Curriculum Activity Guide, p. 161 and p. 201.*
6. *Spray/sprinkle water on the watershed.* Does all the water just run off the surface of the land and end up in the lake (or river, Gulf, etc.)? *Students suggest other destinations for the water: evaporation, percolating into the soil to become groundwater, being taken up by plants or becoming drinking water for humans (such as Bayou Lafourche).*

POINT SOURCE Water Pollution

7. We can also learn how pollutants move about in our watershed – where they come from and where they go. Two main kinds of pollution enter our watershed. The first is called point source water pollution and the second is called nonpoint source water pollution. Their names describe where they come from. **Point source water pollution** comes from a particular point such as a pipe or a drain. We can tell where the pollution is coming from, so we know what to do to treat and reduce point source pollution. The second kind, **nonpoint source water pollution**, is more difficult to pinpoint because it comes from many places. Often we don't know where it began.
8. Can you suggest any places on the model that could be a source of point source water pollution? *Students suggest point source locations such as an industrial plant, sewage plant and/or storm drain. Locate an industrial plant on the model. Hand a spray bottle that contains a cocoa powder and water mix and have them spray the mixture around the industrial plant.* What happens to the point source water pollution? Where did the "pollution" go? *Students observe that pollution enters the stream via the drainage ditches and/or pipes from the industrial plant.*
9. Industrial plants actually have to follow strict laws to keep the amount of pollution they release as low as possible. If they don't follow the rules, the watershed can become polluted. They also can be fined large sums of money by the Louisiana Department of Environmental Quality, which is charged with monitoring and keeping our water resources clean. To reduce the amount of pollution industrial plants release, the plants have water treatment facilities on site. Their wastewater is treated before being released. The pollutants are removed and often recycled in the factory. This also saves money and conserves resources.
10. Sewage plants can also be a point source for water pollution. What is the job of a sewage treatment plant? Sewage plants clean wastewater from the bathrooms and kitchens of homes, schools, businesses and other buildings in the community – and often stormwater that drains from streets. Sewage plants treat wastewater to remove solid material, pathogenic organisms and harmful chemicals. A sewage treatment plant provides "primary" and "secondary" treatment of wastewater. Water discharged from a sewage plant must meet point source discharge permit regulations as enforced by the Louisiana Department of Environmental Quality.
11. Sewage plants remove pollution from wastewater before it is discharged into the environment. In that way, it protects the health of you and me and reduces our risk of disease. It also protects the environment. *Ask for two volunteers – hand one the spray bottle filled with the cocoa/water mix and the other the water spray bottle. Have the first volunteer spray the mixture into the clarifier tanks of the sewage treatment plants until they are almost full. Have the second volunteer spray water into the clarifier tanks until they overflow.* What just happened? Because the clarifier tanks overflowed, untreated water entered the watershed. When could this happen in real life? This could happen during a heavy rainstorm when the plant can't handle all the water. Sometimes the sewage treatment process breaks down, too, causing improperly treated water to get into the watershed.
12. What problems can untreated or improperly treated sewage cause? Yes. It can make people sick. This is because sewage contains harmful bacteria and viruses as well as large amounts of nutrients that can cause problems in the environment. You definitely don't want to swim in or drink water polluted with improperly treated sewage.
13. Another source of point source pollution is from storm drains. What do storm drains do? Storm drains drain water off the streets during a heavy rainfall. Where does the storm water go? Most communities in Barataria-Terrebonne storm water goes into a ditch or canal and is pumped out into the nearest body of water. In smaller communities, and communities outside a hurricane protection levee, storm water may run directly into a roadside ditch and drain into a wetland or marsh nearby. [*Some communities do treat storm water. Check with your community public works or sewage department about this point.*]

14. Why is pollution in storm drains point source pollution? Because it is usually discharged from a pipe. *This point can get a little confusing and technical. Smaller communities may treat storm water runoff from streets as nonpoint source pollution. However, in larger cities, storm drain discharge may require a discharge permit from DEQ, making it point source pollution.*
15. Do people sometimes use the storm drain to dispose of things? What have you seen people putting in storm drains? Some people dispose of used motor oil, household chemicals, etc. Let's see what happens if we use the storm drain to get rid of our waste oil. Have a volunteer spray the cocoa/water mixture (representing oil pollution) into the streets of the town. Have another person spray additional water (representing rain). Where did all the pollution end up? It ended up in the lake/ocean.

NONPOINT SOURCE Water Pollution

16. Have you noticed how most parking spaces in a parking lot have oil spots in them? When it rains, what happens to that oil and grease? When it rains on our towns, our yards, on farms, forests, construction sites and golf courses, substances such a fertilizers, pesticides, oils, grease, trash, etc., that are on the ground, may get washed off into ditches, gullies, streams, bayous, rivers, canals – and eventually into the main receiving basin or waterbody.
17. Where can we find **loose soil** on our watershed model? Loose soil can be found on a plowed field, construction site, tree harvesting operation, stream bank erosion site, etc. *Have a student sprinkle cocoa powder in one or several of the places suggested. Have another student make "rain" by spraying the watershed with water from a spray bottle. Have students note where the water takes the soil.*
18. Where might **pesticide** be applied on our landscape? Pesticide can be applied to golf courses, yards, farm fields, canal and stream banks, etc. *Have a student sprinkle the red drink mix powder in one or several of the places suggested. Have another student make "rain" by spraying the watershed with water from a spray bottle. Have students note where the water takes the pesticide.*
19. Where would **fertilizer** be used in our landscape? Fertilizer can be applied to golf courses, yards, farm fields, canal and stream banks, etc. *Have a student sprinkle the green drink mix powder in one or several of the places suggested. Have another student make "rain" by spraying the watershed with water from a spray bottle. Have students note where the water takes the fertilizer.*
20. Where do we find **oil and grease** on the ground? Oil and grease can be found in places such as parking lots, driveways, streets, and gutters. *Have a student spray the cocoa/water mix in one or several of the places suggested. Have another student make "rain" by spraying the watershed with water from a spray bottle. Have students note where the water takes the oil and grease.*
21. Where might we find **animal droppings or manure**? Manure can be found in farm fields where there are cows, horses or other farm animals, or on residential lawns were there are pets. *Have a student spread the cocoa paste in one or several of the places suggested. Have another student make "rain" by spraying the watershed with water from a spray bottle. Have students note where the water takes the manure.*
22. Where do people drop **litter**? Litter can be found on roadsides, parking lots, beaches, ball parks, etc. . *Have a student litter in one or several of the places suggested. Have another student make "rain" by spraying the watershed with water from a spray bottle. Have students note where the water takes the litter.*
23. What happened to all the various nonpoint source pollutants we added to our landscape (or watershed)? What does the lake look like now? Much of the pollution ended up in the lake and the lake looks very polluted, but some remained on the ground or in the ditches.
24. Is this what happens in real life? *Students suggest similarities and differences between the simulation and real life nonpoint source pollution.* What are the possible consequences of this nonpoint pollution in our environment? Students brainstorm concequences of nonpoint source pollution either as a whole class or in their groups. Each group can write the consequences and share with the whole class.

Blackline Master

none

Assessment

- none.

Resources

BTNEP Resources:

Portrait of an Estuary, publication by LSU AG and BTNEP

Websites:

Earthtrends, World Resources Institute, 2005, **Watersheds of the World: North and Central America - Mississippi Watershed**, accessed July 11, 2005, at http://earthtrends.wri.org/maps_spatial/maps_detail_static.cfm?map_select=390&theme=2.

Nice map of the Mississippi River watershed.

Terraserver Website, accessed July 13, 2005, at http://www.terraserver.com.

Excellent website to locate and download maps and aerial images of specific locations anywhere in the USA..

Topozone Website, accessed July 13, 2005, at http://www.topozone.com.

Excellent website to locate and download topographic maps anywhere in the USA..

References:

USGS Topographic Map website, April 28, 2005. Accessed July 13, 2005 at http://erg.usgs.gov/isb/pubs/booklets/symbols/.

Information on reading and interpreting topographic maps.

About.com website. 2005. **How to read a topographic map**, accessed July 13, 2005 at http://geography.about.com/library/howto/httopo.htm.

Simple steps to topographic map interpretation. Related links.

Activity 3-7

Understanding Nutrients: Nitrates

Adapted BTNEP/LSU AgCenter: *Nonpoint Source Water Pollution*

Focus/Overview

Understanding the roles of phosphorus and nitrogen in aquatic plant growth and the routes these nutrients take to become components of nonpoint source pollution is an important step toward learning how to control the impact of these nutrients on our ecosystems.

Learning Objectives

The learner will…

- understand that nutrients like nitrates are essential to life.
- participate in a skit to understand the nitrogen cycle.

Louisiana Grade Level Expectations (Science)

4: GLE-50	Explain how some organisms in a given habitat compete for the same resources (LS-E-C1)
4:GLE-72	Predict and describe consequences of the removal of one component in a balanced ecosystem (e.g. consumer, herbivores, nonliving component) (SE-E-A2)
7: GLE-36	Distinguish the essential roles played by biotic and abiotic components in various ecosystems (SE-M-A1).
7: GLE-37	Identify and describe the effects of limiting factors on a given population (SE-M-A2).
HS Biol: GLE-26	Analyze the dynamics of a population with and without limiting factors (LS-H-D3).

Materials List

- construction paper for two sets of labels (below)
- string or tape
- paperclips

Advance Preparation

1. Prepare enough of the following **role labels** from construction paper for all your students to participate. You can use a hole punch and string so that the students can hand them around their necks.
   - 1 – thunderstorm
   - 1 – bacteria and fungi (ammonification)
   - 2 – leguminous plant (nitrogen fixers)
   - 4 – nitrifying bacteria
   - 2 – denitrifying bacteria
   - 1 – artificial fertilizers
   - 1 – plant residues
   - 1 – animal waste
   - plants using nitrogen (all remaining students)
2. Prepare the following cards from construction paper:
   - 40 – atmospheric nitrogen (N_2) - scatter these on the floor
   - 40 – oxygen (O_2) – scatter these on the floor
   - 5 – ammonia (NH_4) – give to animal waste, plant residues
   - 5 – nitrite (NO_2^-) – held by teacher and exchanged with students
   - 5 – denitrate (NO_3^-) – held by teacher and exchanged with students

BTNEP Connection
Water Quality

Grade Level
4, 7, HS Biology

Duration
1 class period

Subject Area
science

Setting
classroom

Vocabulary
nitrogen fixation, hypoxia, nitrification, dead zone, ammonification, limiting factor, denitrification, algae blooms, eutrophication

Original Source
"Is Nitrogen Recyclable?" in BTNEP/LSU AgCenter: *Nonpoint Source Water Pollution*, Activity 7

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

Background

Nitrogen and phosphorus are essential to life and are cycled through the natural ecological systems in an orderly, balanced way. Both are building blocks for amino acids, proteins and DNA for both plants and animals. Without nitrogen and phosphorus, there would be no food chain.

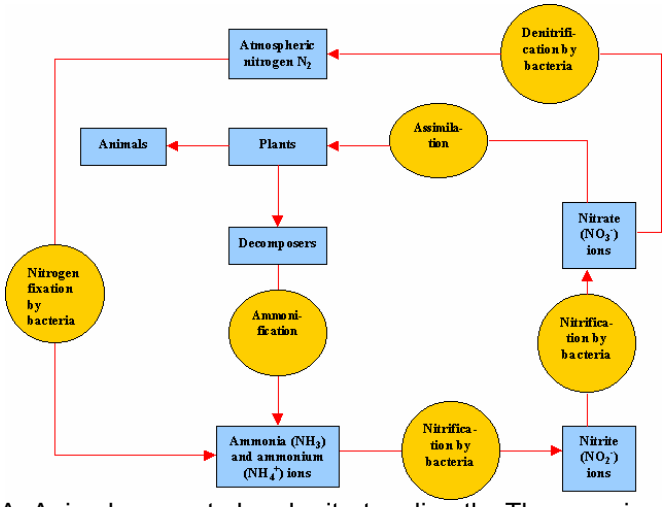
Nitrogen makes up about 78 percent of the atmosphere, yet most organisms can not use this nitrogen. If this is the case, we need to have a source for usable nitrogen. All consumers get nitrogen-bearing compounds in the things they eat. All food, as you know, can be traced back in a food web to a producer. Producers get their nitrogen-bearing compounds from the soil or water in which they grow. Producers are organisms that make their own food, such as algae and plants. Thus, nitrogen is recycled in nature in a series of chemical and biological processes involving a range of living organisms including bacteria, plants and animals and natural phenomena such as lightning. **Blackline Master #1 – The Nitrogen Cycle** outlines the steps in the nitrogen cycle.

Two processes allow nitrogen to be transformed into a useful form (nitrate) for plants to use. First, atmospheric nitrogen can be changed to ammonia through nitrogen-fixing process by bacteria in the roots of certain legumes (plants). Second, decomposing bacteria will first convert nitrogen into ammonia and ammonium, during the nitrogen fixation process. Plants can use ammonia as a source of nitrogen.

Nitrogen fixation is carried out according to the following reaction:

$$N_2 + 3H_2 \rightarrow 2NH_3$$

After ammonium fixation, the ammonia and ammonium that is formed will be further transformed during the nitrification process. Two different types of aerobic bacteria use oxygen to convert ammonia and ammonium ions.



Nitrification takes place according to the following reactions:

$$2NH_3 + 3O_2 \rightarrow 2NO_2 + 2H^+ + 2H_2O$$

$$2NO_2^- + O_2 \rightarrow 2NO_3^-$$

Plants absorb ammonium and nitrate during the assimilation process, after which they are converted into nitrogen-containing organic molecules, such as amino acids, proteins and DNA. Animals cannot absorb nitrates directly. They receive their nutrient supplies by consuming plants or plant-consuming animals.

When nitrogen nutrients have served their purpose in plants and animals, specialized decomposing bacteria will start a process called **ammonification**, to convert them back into ammonia and water-soluble ammonium salts. After the nutrients are converted back into ammonia, anaerobic bacteria will convert them back into nitrogen gas, during a process called **denitrification**. Denitrification takes place according to the following reaction:

$$NO_3^- + CH_2O + H^+ \rightarrow \tfrac{1}{2} N_2O + CO_2 + 1\tfrac{1}{2} H_2O$$

The nitrogen will than be released into the atmosphere again. The whole process will start over after release.

Nitrate is considered a **limiting factor** in soil, because plants need nitrogen in order to grow and make amino acids, proteins and DNA. When there is little nitrogen available to them, the slow or stop their growth. Two things cause nitrogen's position as a limiting factor to be problematic in ecosystems:

1. Nitrate has a high solubility in water so is easily leached out of the soil.
2. Farmers often apply nitrate fertilizers to the soil.

Problems arise when too much nitrogen is present in the soil or water. In particular, this can upset the natural balance in aquatic ecosystems and cause accelerated aquatic plant growth, which can lead to oxygen depletion and death of aquatic organisms. If we pay attention to the news, we may hear about **algae blooms** and fish kills, especially in the summer. Algae blooms are often caused by putting too many nutrients, such as nitrogen (nitrates) and phosphorus (phosphates) into an aquatic ecosystem.

Perhaps you have heard about the "**dead zone**" or "**hypoxia**" in the Gulf of Mexico. This is an example of nutrient overload that results in a zone of oxygen depletion in the Gulf along the coast of Louisiana in the summer. Runoff from agricultural land, forests and cities throughout the Mississippi River watershed enters the Gulf from Mississippi River water and makes its way west along the coast on the shallow continental shelf. The water forms layers, with the fresh river water floating above the heavier salt water. This stratification, or layering, adds to the problem by preventing mixing and oxygenation of the lower, saltier waters.

Another problem, **eutrophication** occurs where the water contains high levels of nutrients and aquatic plant life (including algae) and low levels of oxygen. It is literally premature old are in a waterway! It is not a healthy situation, especially in an area where people make a living from the water.

Procedure

1. We learned that nutrients are important to life, but, when there are too many nutrients in an ecosystem, there can be serious problems. Nature has a way of recycling materials so nothing builds up and becomes a problem. Human activities can upset nature's system, leading to problems like algae blooms and fish kills. We'll learn about the way nitrogen is recycled in nature. This is called the nitrogen cycle.
2. The nitrogen cycle involves several steps and chemical changes. We will simulate the steps using these labels. *Distribute the role labels to the students. Tell them to pin them on their shirts or hang the labels around their necks. Distribute the construction labels showing the various forms of nitrogen and oxygen on the floor.*
3. We start with the nitrogen of the atmosphere. The air is made of 78% nitrogen. In this form it is not very useful to living things in the soil, so it must changed to a form that plants and animals can use. One way this can happen is during a thunderstorm. Lightning causes the nitrogen and oxygen gases to combine to make NO_2 (nitrous oxide).
   THUNDERSTORM: Pick up as many N_2 and O_2 molecules as you can. Paper clip them together to make nitrous oxide and put them on the ground. *Give thunderstorm about 30 seconds to pick up N_2 and O_2 molecules from the floor.*
   LEGUMINOUS PLANTS: Pick up as many N_2 and O_2 molecules as you can. Paper clip them together to make nitrous oxide and put them on the ground. *Give leguminous plants about 30 seconds to pick up N_2 and O_2 molecules from the floor. Leave the paper clipped molecules together on the floor.*
   ANIMAL WASTE AND PLANT RESIDUES: Drop your ammonia labels onto the ground. You have decayed and added ammonia, a nitrogen compound.
   NITRIFYING BACTERIA (two of the four students) – pick up the ammonia and exchange ammonia labels for nitrite labels I have here. *The two students representing nitrifying bacteria pick up the ammonia labels and take them to the teacher, exchanging them for nitrite labels.* Now the other two nitrifying bacteria, take the nitrite labels and exchange them for nitrate labels. *The other two nitrifying bacteria take the nitrite labels from the first bacteria and take them to the teacher to exchange for nitrate labels.*
   FERTILIZER: Throw in all of the nitrate labels. *Students representing artificial fertilizer throw in several nitrate labels.*
   PLANTS: Take only two nitrate labels each and use them for growth. If there are any ammonia or nitrite labels still out, you may each pick up one of those. *Students representing plants collect two nitrate labels as well as any uncollected ammonia or nitrite labels.*
   DENITRIFYING BACTERIA: Pick up two remaining nitrates, bring them to me and exchange them for nitrogen and oxygen. *Denitrifying bacteria exchange nitrates for nitrogen and oxygen. This represents the release of nitrogen and oxygen back into the atmosphere.*
4. What's left in the soil? *Students observe that there are no more labels, indicating no nutrients are available.* What if fertilizer had thrown in more nitrate labels than the plants could pick up? *Then the excess nitrates from the fertilizer would be left in the soil.*
5. Using the knowledge of the nitrogen cycle gained from acting out the skit, we are going to make a diagram of the nitrogen cycle. We need one of each of our labels to create the diagram. Let's begin with nitrogen in the atmosphere. *Orally, go through the same steps as in the skit until the nitrogen cycle is complete. Place arrows between the labels to show the direction of the cycle.*

Blackline Masters

1. **The Nitrogen Cycle**
2. **Forms of Nitrogen in the Nitrogen Cycle**

Assessment

- none

Resources

BTNEP Resources:

Portrait of an Estuary, publication by LSU AG and BTNEP

Websites:

Deacon, Jim, Institute of Cell and Molecular Biology, The University of Edinburgh, n.d., **The Microbial World: The Nitrogen Cycle and Nitrogen Fixation**, accessed January 9, 2006, at http://helios.bto.ed.ac.uk/bto/microbes/nitrogen.htm.

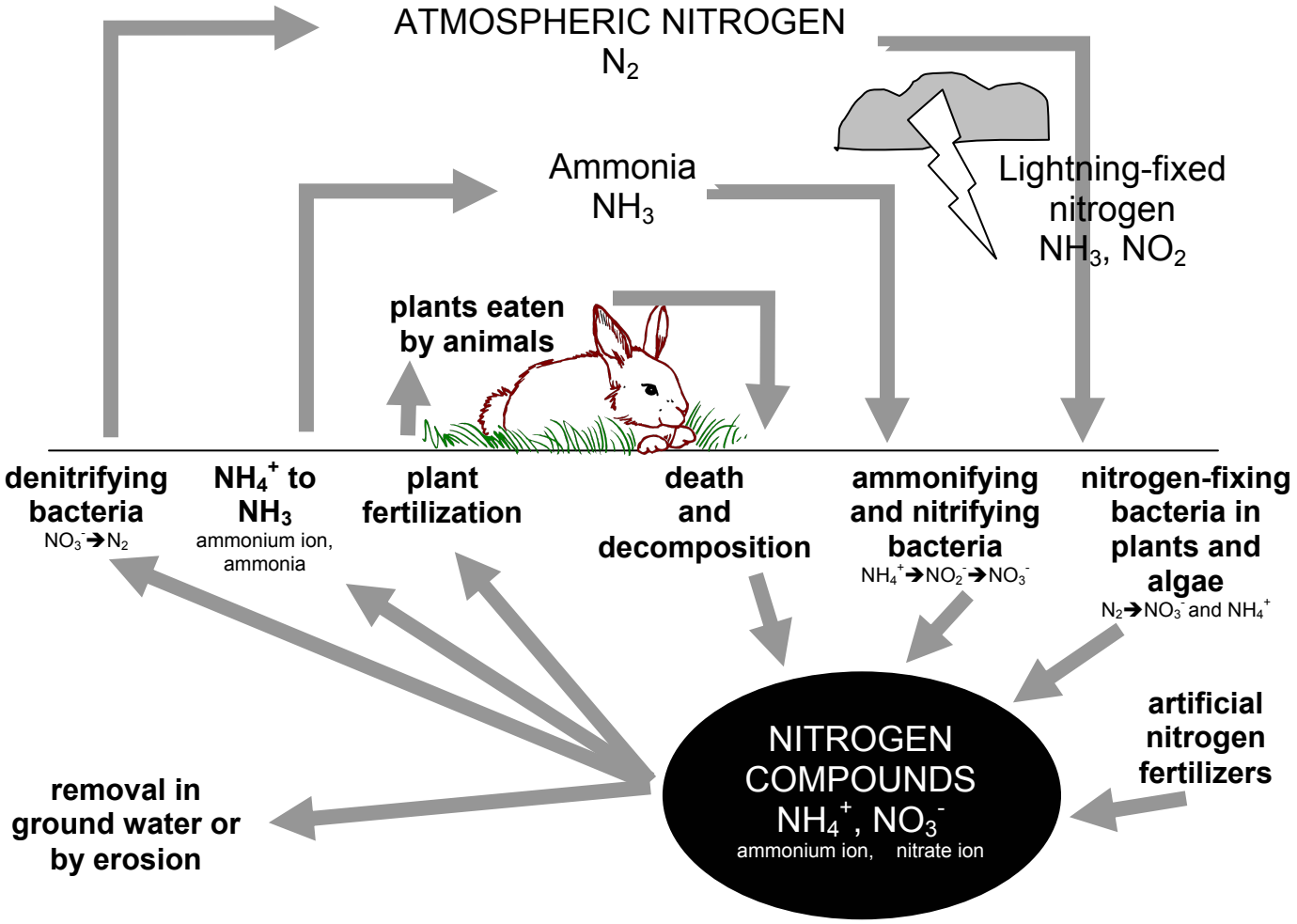
Thorough explanation of the nitrogen cycle.

The Nitrogen Cycle, accessed January 9, 2006, at http://www.neuse.ncsu.edu/nitrogen/.

An interactive diagram of the nitrogen cycle.

Blackline Master #1

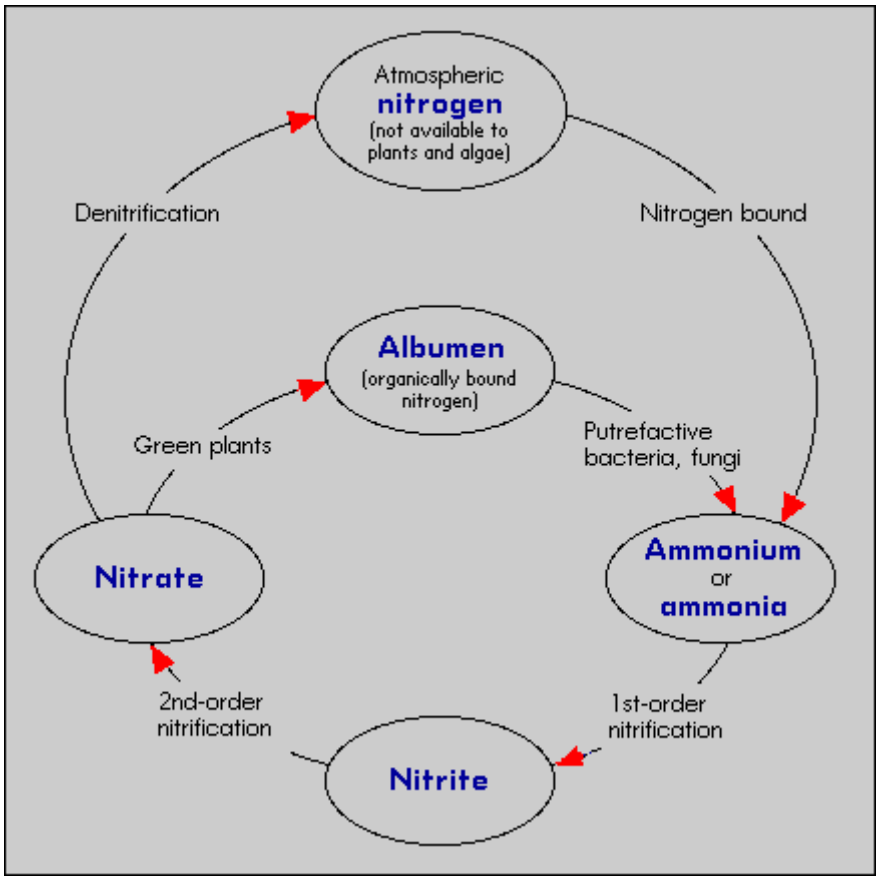
The Nitrogen Cycle



The Nitrogen Cycle

Since animals cannot absorb nitrogen from the air or the soil, they must obtain nitrogen by eating plants or other animals. When these animals die, their bodies are broken down through the action of decomposers. Animal waste and decaying plant materials also contain nitrogen and these materials are also broken down by decomposers. Some bacteria that live in the soil or in the roots of plants called legumes, can convert nitrogen gas into ammonia through a process known as nitrogen fixation. Other bacteria in the soil are able to take ammonium ions and convert them into nitrates, which is a form of nitrogen that plants can absorb and use to make protein. Consumers then eat the producers and reuse the nitrogen to make their own proteins. Some bacteria (denitrifying bacteria) are able to absorb nitrogen compounds from the soil and convert them back to nitrogen gas, thereby completing the nitrogen cycle.

Forms of Nitrogen in the Nitrogen Cycle



Accessed July 20, 2005, at http://www.water-garden.co.uk/expert/nahrstoff.html

Activity 3-8

Understanding Nutrients: Phosphorus Cycle

Adapted from BTNEP/LSU AgCenter: *Nonpoint Source Water Pollution*

Focus/Overview

Understanding the role of phosphorus in aquatic plant growth and the routes this nutrient takes to become a component of nonpoint source pollution is an important step toward learning how to control the impact of this nutrient on our ecosystems.

Learning Objectives

The learner will…

- understand that nutrients like phosphates are essential to life.
- participate in a nutrient game.

Louisiana Grade Level Expectations (Science)

4: GLE-50	Explain how some organisms in a given habitat compete for the same resources (LS-E-C1).
4:GLE-72	Predict and describe consequences of the removal of one component in a balanced ecosystem (e.g. consumer, herbivores, nonliving component) (SE-E-A2).
7: GLE-36	Distinguish the essential roles played by biotic and abiotic components in various ecosystems (SE-M-A1).
7: GLE-37	Identify and describe the effects of limiting factors on a given population (SE-M-A2).
HS Biol: GLE-26	Analyze the dynamics of a population with and without limiting factors (LS-H-D3).

Materials List

- BTNEP poster on Eutrophication (Priority Problem Poster #5).
- Music tape or CD and a player
- Construction paper and tape

BTNEP Connection
Water Quality

Grade Level
4, 7, HS Biology

Duration
1 class periods

Subject Area
science

Setting
classroom

Vocabulary
nutrient, limiting factor

Original Source
"Investigating Nutrients: Nitrates and Phosphates" in BTNEP/LSU AgCenter: *Nonpoint Source Water Pollution*, Activities 5 and 6.

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

Advance Preparation

1. Prepare green name tags of each student. Label half of them ALGAE and divide the remaining name tags equally into two groups labeled SHRIMP and SPARTINA. Cut out the same number of blue squares as you have students – label each with a "P" (for phosphorus). Cut out five brown circles and label each SOIL. Cut out five yellow triangles and label each ORGANIC MATTER. Attach tape to each of these tags so that they are ready for use.
2. Obtain BTNEP Priority Problem Poster #5
3. Choose a music tape and have a player ready.

Background

Nitrogen and phosphorus are essential to life and are cycled through the natural ecological systems in an orderly, balanced way. Both are building blocks for protein and the growth of plant tissue. Without nitrogen and phosphorus, there would be no food chain.

While phosphorus is of great biological importance, it is not very common in the biosphere. Unlike carbon, nitrogen, and oxygen, phosphorus does not enter the atmosphere during its cycle. Instead, phosphorus remains mostly on land in rocks and minerals and in ocean sediments. In these places, phosphorus exists as inorganic phosphate. As rocks and minerals wear down, phosphate is released, where some of it is

taken by runoff of storm waters into rivers and streams, and eventually to the ocean, where it is used by marine organisms. Some of the phosphate that remains on the land is taken up by plants, which bind the phosphate into organic compounds. When plants are eaten by animals, the phosphorus they contain is used by the animals in bones, teeth, shells, and other tissues.

Humans can introduce phosphorus into the system from several sources: human wastes, animal wastes, industrial wastes, and human disturbance of the land and its vegetation. Sewage effluent should not contain more than 1 mg/l phosphorus according to the U.S. Environmental Protection Agency, but outdated wastewater treatment plants often fail to meet this standard. Sometimes storm sewers contain illegal connections to sanitation sewers. Sewage from these connections can be carried into waterways by rainfall and in some areas, melting snow. Phosphorus-containing animal wastes sometimes find their way into rivers and lakes in the runoff from feedlots and barnyards. Fertilizers used for crops and lawns release nutrients like phosphorus that remain dormant and accumulate over a period of years. Furthermore, wetlands that have been drained no longer function as filters of silt and phosphorus, allowing more runoff, and phosphorus, to enter waterways.

Problems arise when too much of a particular nutrient, such as phosphorus, is present. Phosphorus is understood to be a “limiting factor” because plants will use up all the available phosphorus they can find. When the phosphorus is used up, the plants slow their growth. Extra phosphorus entering an aquatic ecosystem can upset the natural balance and cause changes in aquatic plant growth, which can lead to oxygen depletion and death of aquatic organisms. If we pay attention to the news, we may hear about algae blooms and fish kills, especially in the summer. Algae blooms are often caused by putting too many nutrients into an aquatic ecosystem.

Eutrophication occurs where the water contains high levels of nutrients and aquatic plant life (including algae) and low levels of oxygen. It is not a healthy situation, especially in an area where people make a living from the water.

The growth of algae in fresh water is actually limited by the absence of phosphorus. Thus, phosphorus is a “limiting factor.” The items that any organism needs to obtain from their environment can be called **limiting factors**, because their presence or absence or quantity limits the environments in which that organism can live. Algae use up phosphorus rapidly and stop growing when it is depleted. If there is excess phosphorus, an algae bloom is often triggered.

Algal blooms can lead to a decrease in the dissolved oxygen level in a lake or other water body. This decrease in oxygen occurs when algae reproduce so much that they form a thick mat. This results in a decrease in the amount of sunlight that reaches the photosynthetic organisms under the mat during the day. This decreases the amount of photosynthesis and subsequently the amount of oxygen produced by photosynthesis. Benthic photosynthetic organisms may die if too little sunlight reaches them. Dead organic matter becomes a food source for decomposers; this increases the amount of cellular respiration. Cellular respiration requires oxygen and this reduces the dissolved oxygen in the body of water. Therefore, the amount of dissolved oxygen is decreased two ways. The first is due to the decrease in photosynthesis and the second is due to the increase in cellular respiration.

Both phosphorus and nitrogen, along with potassium, are components found in fertilizers. Fertilizers are a substance that adds essential nutrients to the soil. Farmers and gardeners use fertilizers to replay nutrients removed from soil by crops are harvested. All fertilizers have a series of three numbers listed on the label. These three numbers represents the percentage of available nitrogen (N), phosphorus (P) and potassium (K) that is provided by the fertilizer. This series of numbers is called the NPK rating. The nitrogen in the fertilizer promotes overall plant growth. The phosphorus promotes root growth and flowering. Potassium regulates opening and closing of the stomata (little pores in the leaf).

Procedure

1. We are going to play a game called Musical Nutrients. This activity will teach us about a nutrient called phosphorus, which is essential to life and often controls how well plants grow. Too much phosphorus, however, can sometimes cause problems. *Pass out the “P” signs to the students (these represent phosphorus).*
2. Musical Nutrients is like the game Musical Chairs. You are organisms who need enough nutrients to grow. *Have students place all of their chairs back to back in a double row. They need to tape a blue*

"P" square on each chair. Hand out the organism tags to each student have them tape the tag to their clothing. Each of you now represents an organism in our ecosystem.

3. I will play music while you move around the line of chairs. When the music stops, you must claim a chair and sit on it. Let's do a practice round. The "P" on the chair is the phosphorus you need to grow. *Turn on the music for about a minute. Students should move around the chairs to the music. When you turn off the music, each student should find and sit in a chair. Everyone should get a chair this time*.
4. *Stick a brown soil particle on one "P" sign on a chair.* No one may sit on the chair with this soil particle on it. The phosphorus is attached to the soil and unavailable as a nutrient. *Turn on the music. When the music is turned off, the student who does not get a chair this time is "out".*
5. *Stick a yellow organic matter particle on one "P" sign on a chair.* This yellow tag represents phosphorus contained in decaying matter. Only shrimp can get phosphorus from decaying matter, so only a shrimp may sit in this chair. *Turn on the music. When the music is turned off, the student who does not get a chair this time is "out". Continue playing the game, each time adding one or two soil particles and organic matter tags.*
6. *Speaking to those "out" of the game:* Why are you out of the game? *Because phosphorus was not available to them.* Not enough phosphorus means some organisms don't make it and they die. We'll change things a little here and free up that phosphorus trapped in soil and organic matter. When I take off the soil and organic matter tags, anyone can claim the phosphorus again. *Remove the soil particles and organic matter tags from the chairs.*
7. Those of you left in the game, stay in your seats. Now all the algae left in the game, pick someone who is out to join you as a new algae. This will double our algae population. Next time I stop the music we must let the algae have a seat first, because they need the phosphorus and, in real life, algae would take up phosphorus very quickly. So let the algae sit. Then, if you are not an algae, see if there is a seat left for you. It may not sound fair, but we are simulating nature, and in nature some organisms have an advantage over others from some things.
8. What do we now have the most of? *Algae*. This is what is meant by an "algae" bloom. Algae populations quickly grow very large as they take in the available nutrients in the water. What caused the algae to bloom? There was plenty of phosphorus for them and they were given an advantage for getting it.
9. After the game is over, review the ideas in the game. Discuss how, when insufficient nutrients were available in the game, some organisms did not survive (they were out of the game). When more nutrients were added to the game, the algae were the ones to benefit the most and they multiplied rapidly, causing an algae bloom. Algae are very efficient at absorbing phosphorus and using it up fast. If there is plenty of phosphorus, there will be plenty of algae. If there's little phosphorus, there will be little algae.

Blackline Master

1. **The Phosphate Cycle**

Assessment

- none

Resources

BTNEP Resources:

Portrait of an Estuary, publication by LSU AG and BTNEP

Websites:

The Environmental Literacy Council, July 10, 2005, **Phosphorus Cycle**, accessed January 9, 2006, at http://www.enviroliteracy.org/article.php/480.html.

Clear explanation of the phosphorus cycle along with teacher materials including diagrams and additional information on phosphorus.

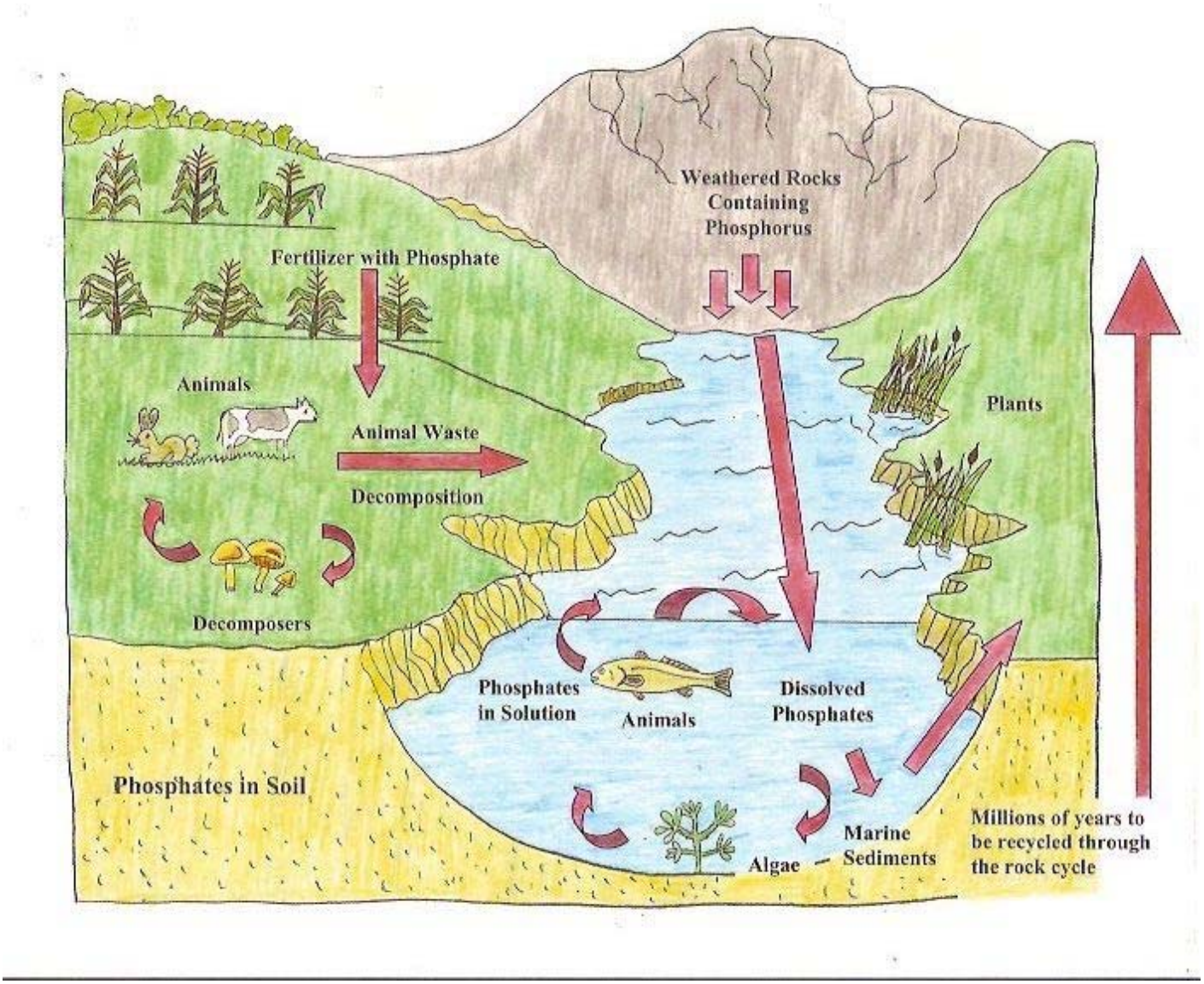
References:

DeBusk, William F., n.d. Phosphorus Cycling in Wetlands, accessed January 9, 2006, at http://edis.ifas.ufl.edu/SS302.

Blackline Master #1

The Phosphorus Cycle

Drawing by: Lainey Pitre



Description of the Phosphorus Cycle.

Phosphate erodes from rocks and minerals. Plants are able to incorporate phosphate found in the soil into their tissues. This phosphate is then passed on to the next trophic level when consumers eat the producers (plants). Consumers assimilate this phosphate into teeth, bones, shells, etc. As these organisms die, their phosphates, once again, become available for plants to repeat the cycle.

The recycling of phosphorus (as phosphate) is slow because no biologically important form of phosphorus is gaseous. Phosphates that become part of marine sediments may take millions of years to solidify into rock, uplift as mountains, and erode to again become available to organisms. This part of the phosphorus cycle is extremely slow.

Humans introduce phosphorus through a number of sources: human wastes, animal wastes, industrial wastes, and human disturbance of the land and its vegetation. When this additional phosphorus enters the system, plants respond by excessive plant growth. In aquatic environments, this can have large effects. Aquatic algae use up phosphorus rapidly and only stop growing when it is depleted. This excessive growth of algae is often called an **algae bloom**.

Algal blooms can lead to a decrease in the dissolved oxygen level in a lake or water body. This decrease in oxygen can occur two ways. Sometimes the algae reproduce so much that they form a thick mat, which can block or seriously reduce in the amount of sunlight that reaches the photosynthetic organisms under the mat during the day. Without sunlight, these photosynthetic plants and animals can produce little oxygen. Bottom-dwelling photosynthetic organisms may die if too little sunlight reaches them. The second way that dissolved oxygen is reduced in the water occurs when dead organic matter becomes a food source for decomposers. In the decay process, the level of cellular respiration increases. Cellular respiration requires oxygen and this reduces the dissolved oxygen in the body of water. Therefore, the amount of dissolved oxygen is decreased two ways. The first is due to the decrease in photosynthesis and the second is due to the increase in cellular respiration.

Eutrophication occurs where the water contains high levels of nutrients and aquatic plant life (including algae) and low levels of oxygen. Eutrophic waters appear to be vivid green in color, indicating large numbers of algae in the water.

Activity 3-9

The Effect of NO_3 on Plant Growth

Adapted from BTNEP/LSU AgCenter: *Nonpoint Source Water Pollution* & *Bottle Biology*

Focus/Overview

This activity sets up an experimental design to investigate the effect of various concentrations of fertilizer on plant growth.

Learning Objectives

The learner will…

- set up an experimental design to investigate the effects of fertilizer on aquatic plant growth.
- record results after one week and draw conclusions from their data.

Louisiana Grade Level Expectations (Science)

7 INQ: GLE-4	Design, predict outcomes, and conduct experiments to answer guiding questions (SI-M-A2).
7 INQ: GLE-5	Identify independent variables, dependent variables, and variables that should be controlled in designing an experiment (SI-M-A2).
7 INQ: GLE-12	Use data and information gathered to develop an explanation of experimental results (SI-M-A4).
7 INQ: GLE-22	Use evidence and observations to explain and communicate the results of investigations (SI-M-A7).
7: GLE 37	Identify and describe the effects of limiting factors on a given population (SE-M-A2).
7: GLE 39	Analyze the consequences of human activities on ecosystems (SE-M-A4).
HS INQ: GLE-4	Conduct an investigation that includes multiple trials and record, organize, and display data appropriately (SI-H-A2).
HS INQ: GLE-9	Write and defend a conclusion based on logical analysis of experimental data (SI-H-A6) (SI-H-A2).
HS: Biol-26	Analyze the dynamics of a population with and without limiting factors (LS-H-D3).

BTNEP Connection
Water Quality

Grade Level
7, HS Biol

Duration
1-2 class periods

Subject Area
science

Setting
classroom

Vocabulary
limiting factor

Original Source
"Effect of NO_3 on Plant Growth" in BTNEP/LSU AgCenter: Nonpoint Source Water Pollution, Activity 8, and adapted from *Bottle Biology*.

BTNEP Barataria-Terrebonne National Estuary Program
www.btnep.org

Materials List

Students can bring their own 2-liter bottles.

- 3 two-liter soda bottles per group of four students
- 2 potted plants per group (about 4" high)
- Duckweed or other small floating aquatic plant
- Sand
- Soluble plant food such as "Miracle Grow"
- Distilled water
- 100 ml measuring container or graduated cylinder
- Sharp scissors
- Stapler
- Containers to hold fertilizer solution (three containers per workstation)

Background Information

See background information in activities focused on nitrogen and phosphorus cycles (Section 3, Act 7, 8).

Advance Preparation

1. Set up six or more workstations around the room. Each station should have the materials to make three terr-aqua columns. One will be a control, one will receive a dilute fertilizer application and the third will receive a more concentrated fertilizer application.

2. Place sand in a container that will allow water drainage (cheese cloth can be used in a colander). Drain several cups of distilled water through the sand to leach out any existing nutrients. Allow sand to partially dry.
3. Remove labels from two-liter containers – rinse containers thoroughly. (Students can be told to do this prior to bringing in their two-liter containers.
4. Make lines for cutting around the shoulder of the bottles (about 10 cm down from the cap). A good technique is to place the bottle on its side in a shallow box, position the marker horizontally so the point touches the side of the bottle, but is stable, and then slowly rotate the bottle to produce an even line circling the bottle.
5. With sharp, pointed scissors, cut along the lines to make a cylinder and a funnel-shaped piece from each bottle.
6. Cut small holes in the upper portion of the cylinders (5 cm from the top) to allow air circulation.
7. Make small holes in the cap using hot wire heated over a Bunsen burner or stove top. Screw caps onto funnel sections.
8. Prepare fertilizer solutions: One solution according to directions on the container, and the other solution, double strength. Use distilled water to make the solutions.
9. Set up the workstations: Each station has three two-liter bottles cut into two with holes in the lids and in the sides of the bottom parts. Each group has clean sand, three small plants and duckweed in water. Each station also has labeled containers of the two fertilizer solutions and one container of distilled water.

Procedures

1. The experiment we will do this week will simulate the situation where a waterway receives too much nitrate nutrients. We will set up an experimental design that has a control and two levels of our independent variable, concentration of nitrate (or fertilizer).
2. You will work in groups of four. The materials are set out at the workstations around the room. Each group has three two-liter bottles cut into two with holes in the lids and in the sides of the bottom parts. Each group has clean sand, three small plants and duckweed in water.
3. Distribute student worksheets, **Experimental Design** (**Blackline Master #1**). Your worksheet has a diagram showing how to put the experimental apparatus together. Follow the directions on the worksheet. Have students set the columns, labeled with their group name, in an evenly lighted place. Have students record the changes in their columns on their data sheets, **Experimental Design and Data Collection (Blackline Master #2)**, over the next week.
4. At the end of a week, have students complete **Results and Conclusions (Blackline Master #3)**.

Blackline Master(s)

1. **Experimental Design**
2. **Experimental Design and Data Collection**
3. **Results and Conclusions**

Assessment

- Assess student's data, results and conclusions drawn from the experiment.

Resources

References

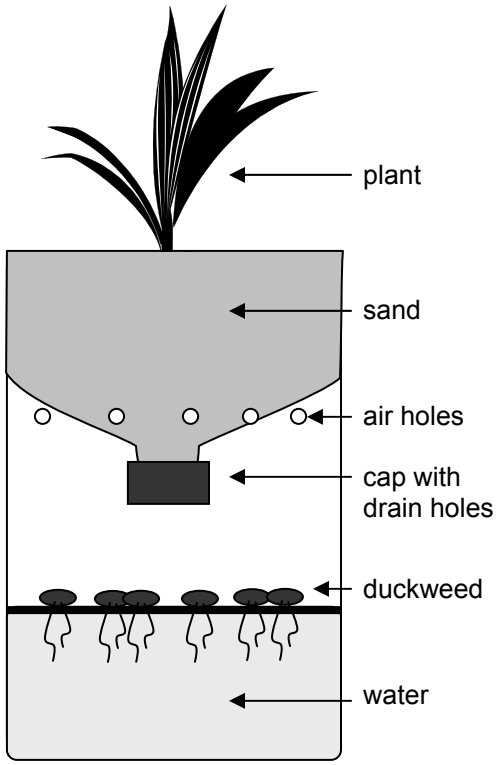
Bottle Biology: See It, Touch It, Smell It, Taste It… accessed January 9, 2006, at http://www.bottlebiology.org/.

Blackline Master #1

Experimental Design: Constructing Terr-Aqua Columns to Investigate the Effects of Fertilizer on Aquatic Ecosystems

Materials Checklist:

- ☐ 3 two-liter bottles, each cut in two
- ☐ 3 caps with holes
- ☐ container of clean sand
- ☐ 3 small plants
- ☐ container of duckweed in water
- ☐ distilled water
- ☐ weak fertilizer solution
- ☐ concentrated fertilizer solution
- ☐ 100 ml graduated cylinder



Directions:

1. Pour 300 ml of distilled water into the bottom of each bottle.
2. Remove an equal amount of duckweed plants (for example, 30 plants) from their containers and place them in the water in each of the three bottles.
3. Screw the caps on the upper (funnel) sections of the bottles.
4. Place the upper (funnel) sections upside down in the bottom sections as shown above. Staple them in place.
5. Remove the plants from their containers and gently wash wash the soil from their roots.
6. Place the cleaned sand in the funnel part of your Terr-Aqua Column.
7. Place the plant in the sand.
8. Mark your Terr-Aqua Column: Control, E1 and E2. Label each bottle with your group name.
9. Water the control plant with 50 ml of distilled water.
10. Water E1 with 50 ml of the weak fertilizer solution.
11. Water E2 with 50 ml of the concentrated fertilizer solution.
12. Place your columns near a window, making sure all receive equal amounts of light.
13. Record your observations on the data sheet each day.
14. If you have a water quality testing kit, conduct nitrate and dissolved oxygen tests on samples of the water in the bottom layer on the first and last days of the experiment. Compare the results.

Blackline Master #2

Experimental Design and Data Collection: The Effects of Fertilizer on Aquatic Ecosystems

In this experiment,
The Independent Variable is _____.
The Levels of the Independent Variable are _____.
Variables held constant are: _____
_____
The Dependent Variables are: _____
_____
_____

A well-written hypothesis that includes both the independent and dependent variables for this experiment would be: _____
_____
_____

Experimental Data

DAY 1

Dependent Variables	Control	E1	E2
Height of plant (mm)			
Appearance of leaves			
No. of duckweed plants			
Appearance of water			

DAY 2

Dependent Variables	Control	E1	E2
Height of plant (mm)			
Appearance of leaves			
No. of duckweed plants			
Appearance of water			

DAY 3

Dependent Variables	Control	E1	E2
Height of plant (mm)			
Appearance of leaves			
No. of duckweed plants			
Appearance of water			

DAY 4

Dependent Variables	Control	E1	E2
Height of plant (mm)			
Appearance of leaves			
No. of duckweed plants			
Appearance of water			

DAY 5

Dependent Variables	Control	E1	E2
Height of plant (mm)			
Appearance of leaves			
No. of duckweed plants			
Appearance of water			

Blackline Master #3

Results and Conclusions:
The Effects of Fertilizer on Aquatic Ecosystems

Results:

Write a paragraph describing the changes you observed in your Terr-Aqua Columns. Use the data from your data sheet.

Conclusions:

What statement can you make, based on your results summarized above, about the effect of fertilizer on the growth of terrestrial and aquatic plants?

How do your observations and conclusions relate to what might happen in the natural environment if too much nitrogen fertilizer is used?

Activity 3-10

Measuring the Bayou's Vital Signs

Adapted from BTNEP/LSU AgCenter: *Nonpoint Source Water Pollution*

Focus/Overview

This activity sets up an experimental design to investigate the effect of various concentrations of fertilizer on plant growth.

Learning Objectives

The learner will…

- conduct water quality tests in the field or on water samples brought to the classroom.
- use the test results to assess the health of Bayou Lafourche (or a nearby bayou).

Louisiana Grade Level Expectations (Science)

7 INQ: GLE-22	Use evidence and observations to explain and communicate the results of investigations (SI-M-A7).
7: GLE 37	Identify and describe the effects of limiting factors on a given population (SE-M-A2).
7: GLE 39	Analyze the consequences of human activities on ecosystems (SE-M-A4).
HS INQ: GLE-4	Conduct an investigation that includes multiple trials and record, organize, and display data appropriately (SI-H-A2).
HS INQ: GLE-9	Write and defend a conclusion based on logical analysis of experimental data (SI-H-A6) (SI-H-A2).
HS: Biol-26	Analyze the dynamics of a population with and without limiting factors (LS-H-D3).

BTNEP Connection
Water Quality

Grade Level
7, HS Biol

Duration
1-2 class periods

Subject Area
science

Setting
classroom

Vocabulary
limiting factor

Original Source
"Measuring the Bayou's Vital Signs" in BTNEP/LSU AgCenter: *Nonpoint Source Water Pollution*, Activity 9.

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

Materials List*

Water quality test kits to measure:

- dissolved oxygen (DO) and five-day biochemical oxygen demand (BOD5)
- phosphates and nitrates
- turbidity (or secchi disk)
- fecal coliform (optional)
- temperature
- pH
- salinity

These kits are easy to use and are available from at least two main suppliers: Hach and Lamotte (see resource lists)

** You don't need to do all of these tests to explore the topic of water quality. Choose what aspect you and your students are interested in and select those kits or tests, according to your budget.*

Safety equipment:

- rubber gloves
- goggles

Sampling equipment:

- buckets
- rope
- water samplers (optional)
- a long pole
- string

Other optional equipment:

- dip nets
- plankton net
- zippered plastic bags for samples
- extra water sample bottles

Background Information and Procedure

There are different levels to which you may want to test water quality. Just to expose students to the techniques and the concept of measuring water quality, you can collect some water samples yourself or take one field trip to the bayou and get one set of data. If you want to invest a lot of time and energy, and you have a source of funding that allows you to buy equipment, you can collect accurate data over a long period of time to give you and your students an on-going picture of the health of the bayou. This is the most scientific approach. Follow the procedure from the water quality testing materials you have.

Collecting Samples

The most reliable samples are from the middle of a body of water and below the surface. This obviously provides a challenge when sampling with students. This obviously provides a challenge when sampling apparatus by tying the collecting container onto a long pole that will reach out across the bayou and will allow you to dip the bucket or other container into the water, or, if there is a convenient bridge, to drop the bucket on a rope down into the water from the bridge. Alternatively, you ca go out in a boat, collect the samples and bring them back to the classroom.

The Water Quality Tests

pH. Equipment: pH kit from Lamotte.
This test measures the relative acidity of the water. The pH scale ranges from 1 to 14. A low pH denotes high acidity. A pH of 7 is neutral and a high pH, such as 9, denotes alkalinity. Most living things are adapted to a neutral pH. A healthy body of water usually has a pH of around 7.

Salinity. Equipment: salinity kit from Lamotte.
Salinity is the concentration of chloride ions in the water. In Barataria-Terrebonne, salinity is an important issue. If your portion of the bayou is used for drinking water, you would expect a low reading on this test. SAFETY NOTE: The Lamotte salinity kit involves a titration with potassium chromate and silver nitrate. Be sure the students wear gloves and goggles.

Dissolved Oxygen. Equipment: dissolved oxygen kit from Lamotte.
Dissolved oxygen levels in a waterbody determine the ability of the water to support life. The dissolved oxygen level is a good indicator of the overall health. If you can afford only one kit, choose dissolved oxygen and do several tests during the year to observe the effect of temperature changes on the oxygen levels. An important point to make about the dissolved oxygen test is that the first step in the procedure is to “fix” the oxygen level. If this step is not done, your results will not reflect the actual oxygen levels in the bayou. Once you have done step one, you can take the sample back to the classroom and do the rest of the test. Dissolved oxygen levels depend on temperature. The warmer the water, the few oxygen molecules the water can absorb in solution. Tell the students to observe this relationship. SAFETY NOTE: The Lamotte dissolved oxygen kit also involves a titration. Be sure the students wear gloves and goggles.

Nitrates. Equipment: salinity kit from Lamotte.
Nitrates are one of the kinds of nutrients that can occur in excess in the waterways of Barataria-Terrebonne and can be responsible for excessive growth of algae and other aquatic plants. Along with phosphates, nitrates can cause algae blooms. By measuring the nitrate levels in Bayou Lafourche and other waterways and comparing them with the standards set by the state, the students can access whether nutrient nonpoint source runoff is affecting the bayou. NOTE: The color change involved in this test can be very faint, so help students make an assessment using the colorimeter or octet comparator.

Phosphates. Equipment: salinity kit from Lamotte.
Phosphates are one of the nutrients that limit plant growth in aquatic ecosystems. Algae use up phosphates very fast. Excess phosphates in the water can lead to an algae bloom. When algae blooms occur, the water looks very green (there are also tests for algae levels that you can use). The algae use up oxygen during the dark hours and oxygen levels decline. Also, as they complete their life cycle and die, the individual algae plants fall to the bottom and decay. The decay process also uses a lot of oxygen. Algae blooms can lead to low oxygen levels, or hypoxia. Hypoxia usually occurs during hot weather when oxygen levels are already low and algae can grow fast. NOTE: As with the nitrate kit, the color change is often subtle and students may have trouble reading the results of the test.

Turbidity. Equipment: secchi disk.
The waters of Barataria-Terrebonne are typically turbid (cloudy) and rarely clear. High turbidity is generally considered negative, but it may be quite normal here. The reasons for high turbidity is in our waterways include high levels of organic matter and sediment in the water. Suspended sediment from the Mississippi River can cloud Bayou Lafourche. But, during algal blooms the water will be extra turbid because of all the microscopic algae suspended in the water column. It is useful to collect turbidity data and keep a record over time of the changes. You can choose a simple secchi disk or a kit to measure turbidity. You can easily make a secchi disk and, if your budget doesn't allow for purchasing the other its, you may want to make turbidity your one parameter to measure. NOTE: A secchi disk is an 8-inch disk, the surface of which id divided into four quadrants painted alternately black and white. It is attached to a rope marked in 1-foot increments. To measure the turbidity of a waterbody, simply lower the disk on the rope into the water, stopping at the point at which you can no longer see the pattern on the disk. The depth to which the disk is submerged is then recorded.

Coliform Bacteria. Equipment: fecal coliform kit from Lamotte or Hach.
Coliform bacteria can indicate the possible presence of harmful bacteria in water. Fecal coliform bacteria are present in the digestive systems of all warm-blooded animals, including humans, and are present in the feces of these animals. They also grow on plants and may not indicate fecal contamination. A common example of coliform bacteria is *E. coli*. Fecal coliform bacteria are not in themselves harmful or pathogenic, but, when they are found in large quantities, there is a greater chance of the potential presence of pathogenic or disease-causing organisms in the water. Therefore authorities responsible for determining a waterbody's suitability for drinking, swimming, fishing, oyster harvesting or boating measure the levels of fecal coliform to get an estimate of the presence of pathogens. If fecal coliform counts are higher than 200 colonies per 100 ml of water sample, there is a greater chance of pathogenic organisms being present, and swimmers may become ill. NOTE: As with other tests, you can do a simple test to see if coliform bacteria are present, or you can do a more complex procedure to determine the quantity and quality of the bacteria in the water. Most test procedures require an incubator. Determine which, if any, of these procedures you are quipped to do in your school. There are many products on the market. Some measure total coliform and are used to test drinking water, and other measure fecal coliform specifically.

Water Temperature. Equipment: thermometer.
A simple thermometer is all you need to collect water temperature data. If you are collecting samples from a particular part of the waterbody, be sure to take the temperature in the same place so you can use the temperature data for comparison with other data. Always take the temperature when doing a DO test. You can use the temperature reading to calculate % saturation of dissolved oxygen using the simple scale from the dissolved oxygen kit.

Air Temperature, Weather. Equipment: thermometer.
The student responsible for collecting water temperature should also measure air temperature (in the shade) and note the weather conditions. All of these factors are important when assessing the overall health of the bayou.

Blackline Master
None.

Assessment
- Assess student's data, results and conclusions drawn from the experiment.

Resources
Websites:
U.S. Geological Survey, Water Science for Schools, 30-Aug-2005, **Common Water Measurements**, accessed January 9, 2006, at http://ga.water.usgs.gov/edu/characteristics.html.
Clear information about basic water quality testing.

U.S. Environmental Protection Agency, 9-Sept-2003, **Monitoring and Assessing Water Quality**, accessed January 9, 2006, at http://www.epa.gov/owow/monitoring/monintr.html.
Information about EPA water quality testing.

Blackline Master #1

Measuring the Bayou's Vital Signs

Water Quality Data Table

Site location _____

Parameter	Result of Test	Range indicating poor water quality	Does waterbody pass? Yes or no
water temperature	_____ °C	Above 27°C or 81°F	
dissolved oxygen	_____ mg/l or _____ ppm	3-5 ppm = stress 1-2 ppm = poor (hypoxia) 0 = anoxia	
salinity	_____ ppt	NA	
nitrates	_____ mg/l or _____ ppm	above 0.08 ppm	
phosphates	_____ mg/l or _____ ppm	above 0.65 ppm	
turbidity	_____ NTU	above 8 JTU or NTU	
pH	_____ pH units	below 5.6, above 8.5	
coliform bacteria		for swimming: above 200 colonies/100 ml	
rain in last 24 hours	_____ cm	NA	
air temperature	_____ °C	NA	

Description of weather: _____

_____

Appearance of the bayou – color of water: _____

_____

Floating aquatic vegetation? Y/N _____

Height of water (if tide gauge is available) _____

Depth of water (if possible) _____

Fish, wildlife, insects observed: _____

_____

_____

Blackline Master #2

Conclusions:
Measuring the Bayou's Vital Signs

Conclusions:
How's the bayou doing?

Are these the first data you have collected?

If not, how many other sets of data do you have?

If this is the first set of data collected, write your general impression of how healthy the bayou is based on where your measurements of each parameter falls in the "range" column.

If you have collected previous data, write a paragraph to describe how this set of data compares with previous data collected. Has the bayou improved since last time, or is it doing worse?

Why do scientists collect data through several trials or experiments?

Activity 3-11

Swamp Sweep

Focus/Overview
Students conduct a scientific investigation to determine amounts, types, and sources of debris found along a selected waterway within their community. Results are used to make a positive change towards the problem.

Learning Objective(s)
The learner will
- discuss adverse effects of debris on the wetland ecosystem
- identify common sources of debris in our wetlands
- collect, organize, and analyze data determining amounts and types of debris
- use the results of the data to identify possible solutions or action towards public awareness
- understand that students can make a positive contribution to our community and make a difference in the world

Louisiana Grade Level Expectations (Science)

7 INQ: GLE-22	
7: GLE 39	Use evidence and observations to explain and communicate the results of investigations (SI-M-A7)
	Analyze the consequences of human activities on ecosystems (SE-M-A4)

Materials List
- trash bags (if separating recyclables, get two colors)
- gloves
- clipboard and pen for each group
- clean-up Data Card (obtained through Ocean Conservancy)
- first aid kit
- graph paper
- colored pencils or crayons
- overhead copy of data sheet
- whistle or megaphone (optional)

BTNEP Connection
Water Quality

Grade Level
7

Duration
1 period – fieldtrip
1 period – classroom

Subject Area
science

Setting
outdoors (nearby waterbody), classroom.

Vocabulary
debris, pollution

Original Source
V. Butler's Writing Team.

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

Background Information

Advanced Preparation
1. Copy enough data cards for each group (If you do not have a copy, contact the Ocean Conservancy or Louisiana DEQ to get some)
2. Purchase or order trash bags from Ocean Conservancy or Louisiana DEQ (If your area has a strong recyclable program, you may want different colored bags to separate recyclable materials collected.)
3. Ask students to bring work gloves from home or purchase enough so there is at least one pair per group (Many dollar stores stock work gloves)
4. If a wide area is being covered, you may want to bring a whistle, a megaphone, or two-way radios to communicate with other chaperones and students.
5. Students also enjoy using "Litter Gitters" which are long trash tongs. These are available at Home Depot and Forestry Suppliers for between $10 and $16 each.
6. Choose a clean-up site near your school and set clear boundaries for students. Scout out the area for hidden dangers such as ant piles and poison ivy so you can either mark the area or inform students to steer clear.

7. Predetermine a central drop off point for students to stack their garbage bags. Also, make sure that someone from your parish is alerted and will be able to collect the bags.
8. Constantly remind students of safety rules that include:
   - Students must not attempt to collect trash that includes medical waste, broken glass, or jagged metals. An adult must be alerted so that the trash is collected safely.
   - Students should not touch any dead animals that they may find. Dead animals can carry some diseases.
9. Depending on the area, students should wear jeans and old shoes, bring mosquito spray and sun block, and have water (or provide) water.

Procedures

1. Ask students to close their eyes and imagine that they are taking a trip through one of the most precious ecosystems in the entire world – the Barataria-Terrebonne Estuary System. Read the following guided imagery to the students, asking them to picture the scenes in their mind's eye.

   Drifting slowly with the current, you are enveloped in silence from modern day noises. Above the soft breeze rustling through the leaves, you hear the twittering and whistles of countless colorful birds. Some live here year round, and some are just resting during their long migration. Murky bayou water meanders through ancient cypress trees adorned with long, gray, spiral strands of moss. You pass by a large hill built from thousands of small white clamshells. This long abandoned shell midden created by Native Americans serves as a lone reminder of a civilization that thrived here long ago. Surrounded by timeless wonder, you may be traveling down the dame wondering waterway that some of Jean Lafitte's privateers navigated. Thriving cypress swamps and flourishing marshes provided perfect hideouts for these infamous pirates and their stolen loot. A bright flash of light sparkling in the sunshine catches your eye. Could it be a piece of forgotten treasure? As you cautiously near the bank, you se it is not the silver and gold doubloons you may have imagined. Instead, it is a discarded aluminum can trapped in the long marsh grass. Snapped back from the beautiful past, you take a closer look beyond the fallen limbs and purple swamp lilies. Hidden in the shallow waters are reminders that it is a much different time in which we live. Submerged potato chip bags, portions of a rusted crab trap, plastic water bottles, knotted fishing lines, and fast food wrappers are all visible upon closer scrutiny. (May open eyes)

   Litter not only detracts from the beauty of this magical place, but it also affects the health. In many places, so much trash is discarded, tidal action has formed piles of it along the shore line. Modern plastics and other synthetic materials may take hundreds of years to degrade naturally. Some of the trash is mistaken as food by animals and ingested. They either choke on it or die soon after from internal injuries. In many cases, animals become entangled in the trash. This either limits their ability to breathe, hunt for food, or results in extreme body deformation. Floating debris clogs up waterways and limits the amount of sunlight needed for healthy aquatic systems.

   For nearly 200 years, legends of Lafitte's treasure hidden in the Barataria-Terrebonne Estuary have stirred the imaginations of young and old. With the incredible amount of values provided by the Barataria-Terrebonne Estuary, it may have been considered as Jean Lafitte's most prized treasure. The Barataria-Terrebonne Estuary is one of the most productive ecosystems in the entire world. Times have changed. Unless we take action to do our part and encourage others to assist in the care of this valuable treasure, it may also become part of the folklore as another of Lafitte's lost treasures.

Travel to clean up area.

2. Gather students together in one group and remind them of the importance of what they are doing. Read over safety rules and stress the reasons behind each so there is a clear understanding. Point out the drop off point where bags will be collected.
3. Divide students into groups of 3 or 4 assigning the roles of recorder, bag carrier, and collectors. Distribute gloves, clipboards, pens, and data cards (**Blackline Master #1**) to each group. Review over the data cards, making sure there is a clear understanding of what each item is and how to fill it out correctly.
4. Ask students to look around the selected clean-up area and then look at the categories on their data card. Students must predict which activity they think resulted in the most trash left behind at this specific location.

5. All members of each group should sign their group's data card and their prediction after their name.
6. Allow students enough time for thorough coverage of the area. Motivate groups that do not seem to be putting forth much effort. (Some teachers provide prizes in many different categories such as, most trash collected, weirdest piece of trash collected, etc.).
7. Once complete, collect all data cards, clipboards, pens, and any gloves you may have provided. Reiterate to the students what an important service they are providing for their community and for the environment.
8. Take a picture of all of the students with all of the trash they collected.

   Back at school: copy the data cards; call and remind parish officials about the collected trash and where you left it.

Back at school:

9. Divide class into groups of 2-3. Hand back to students a copy of their data cards.
10. Provide each group of students with a blank data sheet so that they can record the total tabulated results for each category as you tabulate the results on a blank data sheet on the overhead projector.
11. Have each group create a bar graph or a picot graph comparing the total number of items collected in each major category (Shoreline/Recreational, Ocean/waterway, Dumping, etc.). After students have had enough time to create a graph, ask volunteers to share their results.
12. Ask students to infer an explanation for the results. Would their data be different if they cleaned-up a different area? Why? Provide examples with their explanations.
13. Compare the results from your class with the online data card results from the Louisiana Department of Environmental Quality. Does the data you collected compare favorably with the percentages of the types of litter found? How does Louisiana compare with other states as far as volunteers for International Coastal Clean-up Day? How can we urge more people to participate?
14. Explain to students that littering and illegal dumping are widespread problems across our state and in many parts of the country. Based on the data they have collected which group of people would they have to target with an awareness campaign?
15. Brainstorm ideas of how the students could communicate the negative impact that littering has on our environment to the general public (brochures, fact sheets, signs, etc.). List student ideas on the board. As a class, choose one plan of action and follow up on it. Have students research more information on the internet or publications from local agencies.

Blackline Master

1. **Swamp Sweep Data Card**

Assessment

- Results of tabulated data
- Completed picot or bar graph
- Completed awareness project
- Completed pie chart

Extensions

Language Arts

Have students write a descriptive essay reflecting on their activities during the field experience. Ask them to picture the area in ten years. What would it look like if concerned citizens, such as themselves, did not pick up the litter and dumped junk?

Social Studies

Research laws and ordinances concerning littering and dumping in our community. Have a public official speak to the students about these laws and how they are enforced. How could they be stronger laws? Are the laws in place working? Where are the biggest trouble spots in the community?

Math

Have students create a pie graph comparing the amount of each item collected from the Shoreline/ Recreational Activities section. This will provide even more specific information concerning the types of litter found in the area.

The Arts
Have students create posters concerning the importance of not littering and illustrating the negative impact that litter has on the ecosystem and the animals that reside there.

Technology
Use computer to create brochures, fact sheets, or signs to help spread awareness about the impact of littering on our community and environment.

Resources

Websites:

Ocean Conservancy, 2005, ***The International Coastal Clean-up***, accessed July 22, 2005 at http://www.coastalcleanup.org/.

Information on beach sweep activities all around the world.

The Litter Reduction and Public Action Program, Louisiana Department of Environmental Quality, 2005, accessed July 22, 2005 at http://www.deq.state.la.us/assistance/litter/index.htm

Great site on litter abatement activities organized by DEQ around the state of Louisiana: Beach Sweep, Keep Louisiana Beautiful, Great American Cleanup results, Adopt a Road programs, Waste In Place Workshops and more.

Blackline Master #1

Swamp Sweep Data Card
Modified from the International Coastal Cleanup™ Data Card

Cleanup Location

Type of Cleanup: ☐ Shoreline/Beach ☐ Underwater

Zone or Parish Cleaned: _____ Beach or Site Name: _____

Today's Date: Month _____ Day _____ Year _____ Name of Teacher: _____

Number of People Working on this Card: _____ Distance Cleaned _____ miles or _____ km

Number of Trash Bags Filled: _____ Total Estimated Weight: _____ lbs or _____ kgs

Names of Participants in Your Group

Entangled Animals

☐ Dead ☐ Alive. List all entangled animals found during your cleanup. Tell us what they were entangled in (fishing line, rope, net, etc.)

What was the most peculiar item you collected?

SHORELINE AND RECREATIONAL ACTIVITIES			
	Bags _____		Cups, Plates, Forks/Knives/Spoons _____
	Balloons _____		Pull Tabs _____
	Beverage bottles (plastic, 2 liter or less) _____		Food Wrappers/Containers _____ _____
	Beverage bottles (glass) _____		6-pack Holders _____
	Beverage cans _____		Shotgun Shells/Wadding _____
	Caps, Lids _____		Straws, Stirrers _____
	Clothing, Shoes _____		Toys _____
OCEAN/WATERWAY ACTIVITIES			
	Bait Containers/Packaging _____		Fishing Nets _____
	Bleach/Cleaner Bottles _____		Light Bulbs/Tubes _____
	Buoys/Floats _____		Oil/Lube Bottles _____
	Crab/Lobster/Fish Traps _____		Pallets _____
	Crates _____		Plastic Sheeting/Tarps _____
	Fishing Line _____		Rope _____
	Fishing Lures/ Light Sticks _____		Strapping Bands _____
SMOKING-RELATED ACTIVITIES		**DUMPING ACTIVITIES**	
	Cigarettes/Cigarette Filters _____ _____		Appliances _____
			Batteries _____
	Cigarette Lighters _____		Building Materials _____
	Cigar Taps _____		Cars/Car Parts _____
	Tobacco Packaging/Wrappers _____		55-Gallon Drums _____
MEDICAL/PERSONAL HYGIENE		**DEBRIS ITEMS OF LOCAL CONCERN *(please list)***	
	Condoms _____		
	Diapers _____		
	Syringes _____		
	Tampons _____		

Modified from the data card of the Ocean Conservancy.

Activity 4-1

A Song on the Bayou

Pam Blanchard

Focus/Overview

Music is an important part of life in south Louisiana. The people who came and settled this land brought a vibrant music with them. Musicians sing about the joys and sorrows of living on the coast, about what it was like to leave far off homes, about the animals they encounter in everyday life. This lesson focuses on a song about *cocodrie* (or alligators), by a children's Cajun music artist, Papillion.

Learning Objectives

The learner will…

- compare the body parts of a nutria and an alligator.
- describe how the skin, fur and feet of the nutria and alligator are related to their function and to the survival of these animals in their habitats.

Louisiana Grade Level Expectations

3: GLE 36	Compare structures (parts of the body) in a variety of animals (e.g., fish, mammals, reptiles, amphibians, birds, insects) (LS-E-A3).
4: GLE 41	Describe how parts of animals' bodies are related to their functions and survival (e.g., wings/flying, webbed feet/ swimming) (LS-E-A3).

Materials List

- Either purchase the CD ***Papillion – Cajun for Kids*** (available through Amazon.com or OverStock.com) or be able to play the music through an Internet connection.

Background Information

American Alligator.

The American alligator, *Alligator mississippiensis,* inhabits all freshwater wetlands, but are most common in marshes, swamps, ponds, drainage canals and ditches. They are found throughout the southeast United States, as far west as Louisiana and Texas and as far north as the Carolinas. Alligators are tolerant of poor water-quality and occasionally inhabit brackish marshes along the coast. A few even venture into salt water. Smaller alligators (those less than four feet long) tend to inhabit the marshy areas of lakes and rivers. Dense vegetation in these habitats provides protective cover and many of the preferred foods of young alligators.

Alligators are the top predators in their wildlife community; their only natural enemies, after they grow to about four feet, are larger gators and humans. Despite being carnivores, alligators eat just about anything. When they are young, they tend to eat small invertebrates, such as insects and snails, as well as frogs and fish. When they get bigger, they eat mostly vertebrates, including fish, turtles, snakes, water birds, and small mammals. Alligators are not very discriminating in their diet, as they have been known to eat dead animals, as well as nonfood items such as sticks, wires, stones, fishing lures and aluminum cans. They feed mostly at nightfall and during the night.

BTNEP Connection
Culture.

Grade Level
3-4

Duration
one class period

Subject Area
science, art

Setting
classroom

Extension Areas
art, language arts

Vocabulary
cocodrie

Original Source
Author: Pam Blanchard
Idea from V. Butler's Writing Team

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

Alligators become sexually mature once they reach about six feet in length, which can take more than 10 years. April to May is the time of year that alligators to hold their courtship and breeding season. After mating, the females move into marsh areas to nest in June and early July where they remain until the following spring. Males generally prefer open and deeper water year-round. The females construct a mounded nest of aquatic and marsh vegetation. In late June and early July they lay 35 to 50 eggs. The eggs are covered with a layer of vegetation to provide protection and warmth during the 65-day incubation period. The female alligators remain nearby to defend their nest.

In mid-August through mid-September, the young alligators are ready to hatch in mid-August through mid-September. The little hatchlings make high-pitched, grunting sounds, which tells the mother alligators to remove the vegetation covering the hatchlings. The hatchlings are about 6-8 inches long. These small hatchlings stay in the vicinity of the nest for the next two to three years. The mother alligator will stay around the next to protect the young reptiles for the first year. Over their first two years, nearly 80% of the hatchlings will become a food source for other predators, including wading birds, raccoons, bobcats, otters, snakes, large bass and even larger alligators. Alligators can live for 30, 40 or 50 years.

Today, through strict laws, alligators may be harvested during very limited, controlled hunts. They are also raised captivity for the production of meat and skins. Alligator meat is typically sold to restaurants and wholesalers for about $5 to $7 per pound. Alligator skins are used for fine shoes, belts and purses. Prices for skins vary considerably from year to year but have averaged about $25 per foot over the past 10 years.

Nutria.
The nutria, *Myocastor coypus*, is a large semi-aquatic rodent that is native to South America. The generic name is derived from two Greek words (*mys*, for mouse, and *kastor*, for beaver) that translate as mouse beaver. The specific name *coypus* is the Latinized form of *coypu*, a name in the language of the Araucanian Indians of south-central Chile and adjacent parts of Argentina for an aquatic mammal that was possibly this species. In most of the world the animal is called coypu, but in North America the animal is called nutria. In the rest of the world, nutria is the name of the fur of the animal.

Nutria are smaller than a beaver but larger than a muskrat. However, the nutria have a long, rounded, scaly, ratlike tail. The digits are used to groom and to excavate roots, rhizomes, and burrows, and are used in feeding. The hindfoot consists of four webbed, strongly clawed toes and one unwebbed toe. The hind legs are large compared with the forelegs; consequently its back appears hunched. Although appearing awkward, the nutria is capable of fast overland travel for considerable distances. The ears are small and the eyes are set high on the head. The nose and mouth are valvular (i.e., can be closed to prevent entry of water), and nutria are capable of swimming long distances underwater.

Nutria breed year round and are extremely prolific. With a gestation period of only 130 days, in one year, an adult nutria can produce two litters and be pregnant for a third. The number of young in a litter ranges from 1-13 with an average of about five young. Females can breed within a day of having a litter. Females have four pairs of mammary glands that are located on the side of the body, rather than on the belly. Presumably, this positioning of the mammary glands allow the young to nurse with their nose above the water's surface while the mother is floating. The young nutria at birth are fully furred and the eyes are open. Newborn nutria feed on vegetation within hours and will nurse for 7-8 weeks. Young reach sexual maturity at the age of 4 or 5 months. Nutria have lived to as old as 12 years in captivity, but the life span in the wild is probably considerably less.

In the coastal marshes they are often seen moving about leisurely in the daytime, but their period of greatest feeding activity is just prior to sunrise and after sunset. Nutria are strict vegetarians, consuming their food both on land and water, where they shove aquatic plants to their mouths with their forepaws. These animals consume approximately 25 percent of their weight daily. Nutria predominately feed on the base of plant stems and dig for roots and rhizomes in the winter. They often construct circular platforms of compacted, coarse emergent vegetation, which they use for feeding, birthing, resting and grooming. Nutria may also construct burrows in levees, dikes and embankments. Burrows are about 20 cm in diameter and can extend into the bank of streams, bayous and canals for about a meter.

These animals are important fur producers in their native home of South America. They were first brought to the United States for the captive fur trade. On the American market, nutria pelts have at times

been of some value, but currently there is no market for nutria pelts due to the downturn in the fur business. Because of their known competition with muskrats, which are well-established and valuable fur-producing animals in this country, it appears that muskrats may be driven out and replaced by the much less desirable nutria.

Escaped nutria from fur farms in the United States now pose a serious problem to coastal wetland habitat, agricultural farmers (particularly rice and sugarcane) and urban landowners. Nutria feed on the tender roots of wetland grasses, which in areas of infestation, means that they can completely eat out all the marsh grass in an area. Wetland scientists use the term "eat out" to indicate areas of marsh in which all the vegetation has literally been eaten out and only bare marsh mud remain. In addition, nutria burrowing is responsible for caved in canal banks in the urban environment and for damage to irrigation systems for sugarcane and rice farmers.

Advance Preparation

1. Obtain a copy of the CD ***Papillion – Cajun for Kids*** – or have the music ready to play via the computer download. (We've found an inexpensive site to get a copy from is Overstock.com.)

Procedure

1. Ask students if they have ever heard Cajun or Zydeco music. How would they describe the music? What sort of musical instruments are in the Cajun band? *(A fiddle, a guitar, a drum and an accordion)* Ask students what they think might have inspired the early Cajun and Zydeco musicians to write about in their songs.
2. Play the song *Cocodrie* from the ***Papillion – Cajun for Kids*** CD. Ask the students to pick out facts about the alligator that they learned from the song.
3. Pass out the Student Worksheet, and have them sing the song Three Little Nutria's. Pass out the two fact sheet (alligator and nutria). Have students write a song incorporating facts about the two animals.

Blackline Masters

1. **Songs of the Louisiana Wetlands**
2. **Fact Sheet: American Alligator**
3. **Fact Sheet: Nutria**

Assessment

- Have students perform their songs. Tape students and playback the tape for parents during parent's night.

Extensions

Science:

Have groups pretend they have been asked to design a zoo habitat for either an American alligator or nutria. The habitats must be comfortable for the animals, with the type of habitat features the animals like and plenty of nutritious food provided by the zoo workers. Ask students to draw their habitats on construction paper. As an option, they can build model habitats out of Popsicle sticks and other crafts materials.

Resources

CD:

Papillion – Cajun for Kids. 1998. Music Little People.

Papillion is a Louisiana musician and storyteller whose performances are a delightful gumbo of Cajun and Zydeco songs and stories created for young children (and the young at heart). Through Cajun and Zydeco stories and songs, Papillion leads children on exciting journeys to such places as the bayous and swamps to look for the dreaded cocodrie or to the Mardi Gras for a second line parade or chicken chase!

Tradebooks:

Fleming, Candace. 2004. **Gator Gumbo: A Spicy Hot Tale.** Melanie Kroupa Books.

This is a delightful Creole version of the Little Red Hen. Possum, Skunk, and Otter all pick on old Gator. Gator, sick of eating vegetables, comes up with a plan to make some good old fashioned gumbo. The ending, which will be obvious to most adults, will delight and surprise younger children. The mixed medium illustrations accompany this charming story. Reading level: Ages 4-8.

Markle, Sandra. 1998. **Outside and Inside Alligators.** Atheneum Books.

Describes the external and internal physical characteristics of alligators and how they find their food, mate, and raise their young. Reading level: Ages 4-8.

Reneaux, J.J. 2001. **Why Alligator Hates Dog: A Cajun Folktale.** August House Little Folk.

A story about how the alligator, M'su Cocodrie, is determined to get revenge on his tormentor, Dog. Reading level: Ages 4-8.

Simon, Seymour. 2001. **Crocodiles and Alligators.** HarperTrophy.

A wonderful picture book on alligators and crocodiles filled with interesting facts. Reading level: Ages 4-8.

Websites:

National Geographic Channel **Reptile Wild with Dr. Brady Barr: The World of the Crocodilians**, June 27, 2004 at http://www.nationalgeographic.com/crocmap/flash.html

National Public Radio, December 28, 2002, **Hunting Nutria in Louisiana's Bayous**, accessed June 28, 2004 at http://discover.npr.org/features/feature.jhtml?wfId=893207

In swamps and wetlands all over the South, fat, furry rodents called nutria -- a beaver-like animal native to Argentina -- are devouring small plants and sparking huge erosion problems. NPR's Melanie Peeples meets with some Louisiana trappers who earn $4 for each one they catch.

References:

U.S. Fish and Wildlife, n.d., **North American Wildlife**, accessed June 28, 2004, http://www.fws.gov/r5mnwr/lotw/wildlifena.html.

University of Florida, Institute of Food and Agricultural Sciences *AgriGator*, n.d., **The American Alligator *(Alligator mississipiensis)***, accessed June 28, 2004, http://agrigator.ifas.ufl.edu/gators/

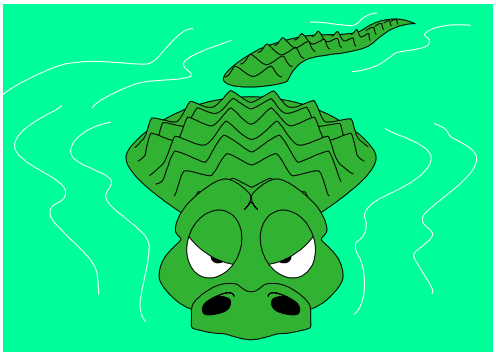
Louisiana Department of Wildlife and Fisheries, 2004, **Nutria**, accessed June 28, 2004, at http://www.nutria.com/site.php

Blackline Master #1

Name _____ Date _____

Songs of the Louisiana Wetlands

Cajun musicians often sing about what they know best: where they live, where they came from, their families, their sorrows and happy occasions. Listen to the song *Cocodrie* on Papillion's ***Cajun for Kids CD***.



What is the song *Cocodrie* about?

_____

_____

How did it make you feel?

_____

_____

_____

_____

What are some of the things you learned from the song about the animal in the song?

Here is a song about another famous Louisiana animal, the nutria. Sing the following song, *Three Little Nutrias* (adapted from Three Little Monkeys, author and copyright unknown) with your students, making up finger and arm motions for the verses!

THREE LITTLE NUTRIAS

Three little nutrias
Sittin' in the marsh
Teasing Mister Alligator,
Can't catch me, can't catch me
Along comes Mister Alligator,
Quiet as can be
And SNAPS that nutria
Right out of that marsh!

Two little nutrias
Sittin' in the marsh
Teasing Mister Alligator,
Can't catch me, can't catch me
Along comes Mister Alligator,
Quiet as can be
And SNAPS that nutria
Right out of that marsh!

One little nutria
Sittin' in the marsh
Teasing Mister Alligator,
Can't catch me, can't catch me
Along comes Mister Alligator,
Quiet as can be
And SNAPS that nutria
Right out of that marsh!

Pick a tune that you like to sing (*Row, Row, Row Your Boat*, or *Rudolph, the Red-Nosed Reindeer*, for example) and write new verses about either an alligator or nutria (or both)! Your teacher has fact sheets about both the alligator and the nutria to help you write great lyrics.

Blackline Master #2

Fact Sheet: American Alligator

Common Name:

- American alligator

Scientific Name:

- *Alligator mississippiensis*

Appearance:

- elongated, armored, lizard-like bodies with muscular flat tail
- long snout with nostrils at the end to allow breathing while most of the body is submerged
- four short legs with five toes on the front feet and four on the rear
- skin on back is armored with rows of embedded bony plates called *osteoderms* or *scutes*
- average adult size range from 8.2 feet for females to 11.2 feet for males and can reach a weight of more than half a ton!
- young alligators have bright yellow stripes and blotches; adults are dark with pale undersides
- snouts are rounded and shovel-shaped
- a flap of flesh covers their throats, an adaption that keeps water out, as their lipless jaws are not airtight.

Range:

- southeastern United States; large populations found in Florida, and coastal areas of Louisiana and Georgia

Habitat:

- large shallow lakes, marshes, ponds, swamps, rivers, creeks and canals in fresh and brackish water areas

Diet:

- insects, snails, fish, crabs, birds, turtles, snakes and mammals

Reproduction:

- sexual maturity depends on age and size
- egg incubation temperature determines sex of embryos
- alligator nests are mounds of vegetation

Behavior:

- courtship begins in early spring followed by nesting in late spring and summer
- most territorial during nesting period and may act aggressively toward intruders

Problems:

- most attacks associated with alligators occur when they have been fed by humans or when defending their nests

Solutions:

- do not feed as they may lose natural shyness toward humans
- do not swim at dusk or night, which is feeding time for alligators; swim only in designated swimming areas
- report nuisance alligators more than 4 feet in length that appear to have lost their natural fear of people or otherwise pose a threat to people or property to the Florida Game and Fresh Water Fish Commission

Legal Aspects:

- American alligators are listed by the state as a species of concern and by the federal government as threatened due to the similarity in appearance to the endangered American Crocodile
- it is illegal to feed, tease, harass, molest, capture or kill alligators

Modified from: University of Florida, Institute of Food and Agricultural Sciences *AgriGator*, n.d., **The American Alligator *(Alligator mississipiensis)***, accessed June 28, 2004, http://agrigator.ifas.ufl.edu/gators/.

Blackline Master #3

Fact Sheet:
Nutria

Common Name:
- Nutria

Scientific Name:
- *Myocastor coypus*

Appearance:
- are a rodent
- have a long, rounded, scaly, ratlike tail
- often confused with beavers
- the nutria's nose and mouth are valvular (i.e., can be closed to prevent entry of water)
- hindfeet is webbed, with large claws.
- ears are small and small black eyes are set high on the head
- females have mammary glands located on the side of their bodies so babies can nurse while mother is floating.

Range:
- southeastern United States, though out the Gulf of Mexico states

Habitat:
- large shallow lakes, marshes, ponds, swamps, rivers, creeks and canals in fresh and brackish water areas

Diet:
- strict vegetarians, favor tender roots of wetland plants.

Reproduction:
- extremely prolific, can produce two litters of up to a dozen young and be pregnant for a third litter at the end of the year.
- young reach sexual maturity at the age of 4 or 5 months.
- females can breed within a day of having a litter

Behavior:
- courtship begins in early spring followed by nesting in late spring and summer
- most territorial during nesting period and may act aggressively toward intruders

Problems:
- responsible for wetland destruction through "eat outs" – areas that have been denuded of vegetation due to intensive grazing by nutria
- populations of nutria are out-competing the more favorable (native) muskrat for habitat.

Solutions:
- the Louisiana Department of Wildlife and Fisheries is encouraging the hunting of nutria for their fur and meat.
- business efforts are directed at marketing the meat of the nutria overseas.

Modified from: Louisiana Department of Wildlife and Fisheries, 2004, **Nutria**, accessed June 28, 2004, at http://www.nutria.com/site.php.

Activity 4-2

Ask an Expert

Adapted from BTNEP/*LSU AgCenter: Coastal Land Loss and Restoration*

Focus/Overview

Students will conduct oral history interviews about how the Louisiana coast has changed during their lifetime.

Learning Objectives

The learner will…

- identify a family member or friend who is willing to be interviewed about the changes to the coast he or she has witnessed.
- conduct a survey with that individual to determine what changes to the landscape, the habitats and the fish and wildlife have taken place.
- develop a questionnaire covering key past, current and future land loss issues.
- record the interview on video or audio tape if equipment is available or make notes.
- prepare a presentation of survey findings.

Louisiana Grade Level Expectations

4: GLE-63	Demonstrate and explain how Earth's surface is changed as a result of slow and rapid processes (ESS-E-A5) (ESS-E-A1).
5: GLE-50	Describe the consequences of several types of human activities on local ecosystems (SE-M-A4).
7: GLE-39	Analyze the consequences of human activities on ecosystems (SE-M-A4).
8: GLE-20	Describe how humans' actions and natural processes have modified coastal regions in Louisiana and other locations (ESS-M-A8).
HS Biol: GLE-27	Analyze positive and negative effects of human actions on ecosystems (LS-H-D4) (SE-H-A7).

BTNEP Connection
Culture.

Grade Level
4, 5, 7, 8, HS Biol

Duration
1 week (to allow time for home interview).

Subject Area
science, history

Setting
classroom/home.

Original Source
"Ask an Expert" in BTNEP/*LSU AgCenter: Coastal Land Loss and Restoration,* Activity 8.

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

Materials List

- Depending on resources, students can use any of the following to record the interview: video camera, audio tape recorder, still camera, notebook and pencil.

Background Information

Conducting surveys helps students develop interpersonal and social skills while they gather valuable information about coastal erosion. They should pick an appropriate interviewee, preferably a member of their immediate or extended family who has lived long enough to witness the changes in the coastal zone, including marsh loss and shoreline erosion. A grandfather, grandmother, great-uncle or great-aunt who has enjoyed fishing along the Louisiana coast for many years is an ideal choice. The students can record or videotape the interviews and edit them before presenting their work.

Advance Preparation

none

Procedure

1. In this activity you are the reporter and will interview someone who is a wetlands expert – not necessarily a scientist (although they could be one), but a regular person who could have had any kind of occupation. The only qualification is that they have spent a lot of time in the wetlands and have witnessed first hand the changes that have taken place because of coastal erosion. The person can be a member of your family, a neighbor or a family friend. Your job is to interview the person to learn as much as possible about their experiences with coastal erosion. The person you choose must be willing and comfortable about being interviewed. Be sure to ask if they mind and to thank them for their time when you are finished with the interview. You can record the interview any way you wish. You can write the answers in a notebook (newspaper reporters do this all the time). You can record the conversation with a cassette tape recorder. You can take photographs of the interviewee, or if you have a video camera in the family and the interviewee doesn't mind, you can videotape the interview.
2. Distribute **A Sample Interview (Blackline Master #1)**. Here is a sample interview. You should adapt the questions to suit the person that you are interviewing. But remember, the objective is to find out how, when, where and why coastal erosion and habitat change have occurred and how this change has affected the people that live, work and/or recreate in south Louisiana.
3. While interviewing your person, if the interviewee wants to go off on a tangent and tell a story or talk about something else, that's O.K., you might learn something interesting! Try not to interrupt or make too many comments if you are recording. Let the interviewee do most of the talking and allow them to take their time during the interview.
4. Students identify their interviewee and adjust the questions on the sample interview.
5. Students should prepare a written summary of the interview, highlighting how, when, where and why coastal erosion and habitat change have occurred and how this change has affected the people that live, work and/or recreate in south Louisiana. They should present their summaries to the class. If time allows, and students are willing, videotapes or tape recordings of portion of the interviews could be shared in class.

Blackline Master

1. **A Sample Interview**

Assessment

- Prepare a rubric for the written summary and oral presentation.

Resources

BTNEP Materials

When You Were My Age

Oral history interview technigues and information on the Bayou Lafourche Oral History Progect. LA Grade Level Expectations for 8th Grade. ***Downloading Instructions:*** Go to http://educators.btnep.org/default.asp?id=49. Click on link When You Were My Age (PDF 380 k). Pages are meant to be printed front and back in the order they download. Staple down the center for a completed booklet.

Tradebooks:

Hubbs, Susan. 2000. **Dig up Your Roots and Find Your Branches: A Child's Guide to Genealogy**. iUniverse, Inc. 108 pp. ISBN: 059513162X

A fun guidebook for children hoping to uncover facts about their family history. Includes simple, yet thorough instructions, puzzles, charts, and ideas for Internet searches! Age Range: 9 to 12

Leavitt, Caroline. 2005. **The Kids' Family Tree Book**. Sterling Publishing Company, Inc. 96 pp. ISBN: 1402709420

Who are my ancestors? What nationalities were they? What work did they do? Kids are always bursting with questions about their family history; they want more stories, more details, more facts. With these research ideas and creative projects, young would-be genealogists can get the knowledge they crave. Information on how to interview family members. Age Range: 7 to 11

Websites:

Allee, Virginia. Council on Foundations. 2003. **A Guide to Interviewing Family Members**, accessed July 7, 2005, at http://www.cof.org/Content/General/Display.cfm?contentID=496.

119 questions divided into several topic areas. Abstracted from Virginia Allee's "A Family History Questionnaire" in October 1978 Family Heritage Magazine.

References:

Gift to the Future2000, Inc. 1996. **Your Story: A Guided Interview through Your Personal and Family History**. Stack Resources LLC. 64pp ISBN: 0963424947

This 64-page hardbound book uses a easy to follow "guided interview" format that includes more than 150 sets of questions designed to generate memories, thoughts and experiences, while providing plenty of space to write responses to those questions, and attach pertinent photographs. Each page is acid-free, archival quality paper.

Greene, Bob, and Fulford, D.G. 1993. **To Our Children's Children: Preserving Family Histories for Generations to Come**. Doubleday & Company, Inc. 211 pp. ISBN: 0385467974.

An attractive and engaging guidebook that makes recording a personal hisrory as uncomplicated and easy as writing a letter. A brief introduction sets the tone of fond remembrance, followed by chapters of questions designed to elicit answers that will form the patchwork of a fascinating personal history.

LoVerde, Mary. 2000. **Touching Tomorrow: How to Interview Your Loved One to Capture a Lifetime of Memories on Video or Audio**. Simon & Schuster Adult Publishing Group. 144pp. ISBN: 068487380X

McLaughlin, Paul. 1993. **Family Remembers: How to Create a Family Memoir Using Video and Tape Recorders**. Self-Counsel Press, Inc. 160 pp. *OUT OF PRINT*. ISBN: 0889082936.

Rosenbluth, Vera. 1997. **Keeping Family Stories Alive: Discovering and Recording the Stories and Reflections of a Lifetime**. Hartley & Marks, Inc. 232 pp. *OUT OF PRINT.* ISBN: 0881791490.

Blackline Master #1

Name _____ Date _____

A Sample Interview

Interview Deadline: _____

You are the BTNEP scientist interested in learning how, when, where and why coastal erosion and habitat change have occurred and how this change has affected the people that live, work and/or recreate in south Louisiana. You have been assigned to the task of conducting an interview to begin to understand this topic. Follow the steps below in developing and conducting your interview.

Step 1. Identify the person(s) you will interview: _____

You should choose an older member of your family, a neighbor, or a family friend who has spent some time in the wetlands and have witnessed first hand the changes that have taken place over the last half century. They should be willing and comfortable about being interviewed.

Step 2. Summarize why you picked this person and what you know about their life.

Step 3. Develop a list of questions you want to ask them during the interview. You need to tailor the questions so they fit the person you will be interviewing. Ask open-ended questions and not "yes or no" or "one word answer" questions. Here are some ideas:

- What is your name?
- Is there a place in the Louisiana coastal area where you have been many times to recreate, fish, hunt or work? If so, where is it?
- When did you first go there?
- What kind of fish and wildlife did you see or catch when you first started visiting that place?
- What did the landscape look like then?
- Has it changed in appearance since then? If so, how?
- If you fish, do you catch as many fish as you used to?
- Have the species of fish changed over time?
- If so, why do you think these changes have occurred?
- What other changes have you seen?
- What do you think are the big problems facing coastal Louisiana?
- What do you think the future holds for your special place?
- Do you think potential solutions to the problems will work?

Additional Questions:

Step 3. Make an appointment for your interview.

Bring the equipment you need to record the interview. Remember to be patient and listen carefully to your interviewee so that you can learn about the coastal change that this person has witnessed over their lifetime.

Step 4. Send your interviewee a thank you (written or verbal) for their time and for sharing their knowledge of coastal Louisiana with you.

Step 5. Summarize in writing what you have learned about coastal land loss from your interviewee. Prepare a short oral summary of what you have learned to share with the class.

Economic Development

Activity 5-1

Weaving Our Wetland Economic Web

Adapted from BTNEP/LSU AgCenter: *Wetland Functions, Values, and Economic Resources*

Focus/Overview

This lesson focuses on creating an understanding of renewable and nonrenewable resources and how these resources are interwoven into the fabric of our coastal economy. Students will collect day through a survey of two adult family members and then create a class set of data that they will use to interpret the interconnections of the wetlands and our coastal economy.

Learning Objectives

The learner will…

- list the economic activities of their community.
- conduct a survey of their families' economic activities.
- construct a Wetland Economic Web concept map for their community.

Louisiana Grade Level Expectations (Science)

5: GLE-50	Describe the consequences of several types of human activities on local ecosystems (e.g. polluting streams, regulating hunting, introducing nonnative species) (SE-M-A4).
7: GLE 35	Identify resources humans derive from ecosystems (SE-M-A1).
7: GLE 39	Analyze the consequences of human activities on ecosystems (SE-M-A4).

Louisiana Grade Level Expectations (Social Studies)

5: GLE-16	Identify the natural resources used by people in the United States (G-1D-M3).

Materials List

- Easel paper
- Index cards and tape or post-it notes
- Markers
- Wetland Economy Questionnaire (**Blackline Master #1**) - 1 per student)

BTNEP Connection
Economic Resources

Grade Level
5, 7

Duration
2 class periods and a homework assignment

Subject Area
science, social studies

Setting
classroom

Vocabulary
renewable resources, nonrenewable resources, revenue

Original Source
"Weaving Our Wetland Economic Web" in BTNEP/LSU AgCenter: *Wetland Functions, Values, and Economic Resources*, Activity 8.

BTNEP Barataria-Terrebonne National Estuary Program
www.btnep.org

Background Information

Renewable Natural Resources of Barataria-Terrebonne Estuary.
The biological productivity of wetlands leads to a wealth of renewable resources that are extremely valuable to society. Fish, shellfish, timber, furbearing animals, and alligators all contribute greatly to the economy of coastal Louisiana and in particular the Barataria and Terrebonne basins. The annual seafood harvest of Barataria-Terrebonne alone contributes $200 million to Louisiana's economy. In addition, the annual Barataria-Terrebonne timber revenues exceed $2 million, mostly hardwood timber, principally cypress; the annual fur harvest is worth more than $680,000, or 61% of the state's fur income; and annual alligator hunting revenues of Barataria-Terrebonne have been as high as $6 million.

Non-Renewable Natural Resources of Barataria-Terrebonne Estuary.
The geology of the Barataria and Terrebonne basins is responsible for the production of large reserves of oil and gas as well as sulfur and salt. Oil and gas alone accounted for revenues in the Barataria-Terrebonne estuary exceeding $2 billion per year between 1988 and 1994. Recent technological

advancements such as three-dimensional seismic technology should increase this annual income in upcoming years. These resources also provide the raw materials for the chemical manufacturing industry located in within the estuary. In addition to the direct revenues of oil and gas production, the economy is boosted from the activities supporting the industry.

Procedures

1. The wetlands of Barataria-Terrebonne are important to the economy of our community. The wetlands provide resources that provide revenues, or income, to our community. Resources can be divided into ***renewable resources*** and ***nonrenewable resources***. Let's write down all the renewable and nonrenewable resources we can think of. (Hand out index cards or post-it notes to students. Have them write one resource on each piece of paper.)
2. What would we list under renewable resources? (Have students come up and post their ideas for renewable resources.) What would we list under nonrenewable resources? (Post these papers.)
3. The presence of these resources provides not only revenues, but employment. When there is a source of revenue and a source of jobs for the people, the economy of the area is healthy. The more of both we have, the better off everyone is economically. If the resources we just listed all disappeared, what changes would we see in our communities? Would these changes affect you? (Students will reply that less money would come to the parishes and people would lose their jobs. There would be less income so people would spend less money, causing other businesses, such as stores, to suffer. People would have to leave the area to find work.)
4. Your family represents a sample of our community. If we list the occupations of some of your family members, we'll be able to see how our lives are linked to the wetlands.
5. Hand out two post-it notes or index cards to each student. Have them write down the occupations of two close family members. Let's organize the occupations of our family members into types of jobs. (Group the occupations under headings such as commercial fishing, oil and gas, service industries (including restaurants, hotels, stores, banks, etc.), eco-tourism, other – you can add additional categories as necessary.)
6. Now let's see how these occupations are connected to the wetlands. (Help the students make connections between the jobs their families have and the wetlands. Most of the links will be through the fishing industry.)
7. If the wetlands disappeared, which of these occupations would also disappear or change? (Students will recognize that those involved in the fishing industry, specifically shrimping and oyster farming, would have to find another occupation if there were no more wetlands. They may see that if the fishing industry fails, so will the businesses that support it – boat building, net suppliers, ice houses, fuel stations, etc. In the case of the oil and gas industry, it would be much more expensive to produce oil and gas if the marsh was lost. All infrastructure, such as pipelines, well heads, etc., would also be endangered or lost.)
8. The next step of this investigation is to take home a short survey for your family to help you complete. It will give us a little more information on how our economy is linked to the wetlands of our area. You will need to interview at least two different people in your family, such as you mom, dad, aunt, uncle or grandparent. (Pass out the survey, **Wetland Economy Questionnaire**, and review it with the students, answering any questions they might have about the survey instrument.)
9. Have students return the completed survey and compile the data on the chart worksheets, **Wetland Economy Data Chart – Family Occupations** and **Wetland Economy Data Chart – Importance of the Wetlands to Occupation.**
10. As a class, summarize what was learned from the student-collected data in a large illustrated concept map, **Wetland Economy Concept Map** worksheet. Alternatively, students can create an individual concept map of what they learned from the activity.

Blackline Masters

1. **Wetland Economy Questionnaire** (one per student)
2. **Wetland Economy Data Chart – Family Occupations**
3. **Wetland Economy Data Chart – Importance of the Wetlands to Occupation**
4. **Wetland Economy Concept Map**

Assessment

- Students should be able to reflect what they have learned on their concept maps.

Resources

Tradebooks:

Randle, Damian. 1993. **Natural Resources**. Thomson Learning. 32pp. ISBN: 1568470568

Presents an overview of the earth's natural resources, describing what they are, where they are found, how they are used, and how this use affects the environment. Age Range: 9 to 11

CDs

Louisiana Wetland Functions and Values CD developed by LSU AgCenter's Extension Service in conjunction with the U.S. Geological Survey's National Wetlands Center and the Louisiana Department of Natural Resources (DNR). To receive a copy, contact DNR (800/ 267-4019) or order on the Internet at http://www.lacoast.gov.

Blackline Master #1

Wetland Economy Questionnaire #1

1. Name and occupation of family member completing questionnaire:

   Name _____ Occupation _____

2. How many years has your family been involved in this occupation? _____ years
3. How many years have you personally been involved in this occupation? _____ years
4. How would you rate the presence of the wetlands (marshes and swamps) in importance to your family's profession? (circle one of the following)

   A. Extremely important
   B. Very important
   C. Important
   D. Not important
   E. The wetlands interfere with my occupation

5. Does the loss of wetlands in our area cause any problems for your occupation? Yes No
6. If yes, in what way?

   _____

   _____

7. Does the company of business you work for obtain supplies from other businesses in this parish? Yes No
8. If your company or business left the parish, how would the economy of the parish be affected?

   _____

   _____

   _____

   _____

Additional Notes:

Blackline Master #2

Wetland Economy Data Chart – Family Occupations

Your teacher will help the class tally the information needed for this chart. Record the final tally information in the chart below.

Number of families in selected occupations						
Commercial fishing, natural resource harvesting	Fisheries and trapping suppliers	oil and gas production	oil and gas suppliers	eco-tourism, recreational activities	service industries	other occupations

Create a bar graph using the data from the chart above.

Title of Bar Graph: _____

Selected occupations

Summarize what your data from your chart means: _____

_____

_____

_____

Blackline Master #3

Wetland Economy Data Chart – Importance of Wetlands to Occupation

Your teacher will help the class tally the information needed for this chart. Record the final tally information in the chart below.

Rating the Importance of Wetlands				
A essential	**B** very important	**C** important	**D** not important	**E** a hindrance

Create a bar graph using the data from the chart above.

Title of Bar Graph: _____

Importance Rating

Summarize what your data from your chart means: _____

_____

_____

_____

Blackline Master #4

Wetland Economy Concept Map

Based on the information you and your classmates collected, create a concept map that explains how the wetlands and the economy are interconnected.

Economic Development

Activity 5-2

Wetland Promotions

Adapted from BTNEP/LSU AgCenter: *Wetland Functions, Values, and Economic Resources*

Focus/Overview

This lesson focuses on creating brochures that deal with eco-tourism. This type of promotional material needs to accurately portray the functions and values of our coastal wetlands.

Learning Objectives

The learner will…

- design a brochure advertising an imaginary swamp tour, charter fishing business, duck hunting guide service, hotel or guest house, or other tourist venue.
- investigate promotion and advertising in the tourism business.

Louisiana Grade Level Expectations (Science)

5: GLE 26	Identify and describe ecosystems of local importance (LS-M-C3).

Materials List

- Brochure planning worksheet (1 per student)
- Computer (optional)
- Magazines or materials from Tourist Commissions
- Examples of tourism promotional materials.

Background Information

The recreational activities supported by the wetlands of Barataria-Terrebonne are closely tied to the economy. It is impossible to separate these two areas.

Hunting and Fishing. Recreational fishing is big business in Louisiana, and Barataria-Terrebonne is no exception. In the 1992-1993 fiscal year recreational fishermen in Barataria-Terrebonne contributed about $124.9 million to the economy. This figure involves purchasing licenses, fishing equipment, boats, bait, camps, etc. About 313,950 licenses were sold in Barataria-Terrebonne in 1992-93. About 100,000 sport hunting licenses are issued annually in Barataria-Terrebonne. Hunter-related business also includes guns, ammunition, camps and other equipment, all of which contribute significantly to the economy.

Eco-Tourism. The growing popularity of coastal wetlands and Louisiana's culturally related tourist attractions are important to the economy of Barataria-Terrebonne. Swamp tour businesses, restaurants, hotels and bed and breakfast enterprises are of benefit, as well as recreational charter fishing boat operators. Visitors from all over the United States and the world visit Barataria-Terrebonne each year. French-speaking Europeans are particularly attracted to the area. Visitors come to observe bird migrations, view wildlife (particularly alligators), and sample the local cuisine that has become world famous. Wildlife viewing in Barataria-Terrebonne has been valued at $30,000 annually, and if the benefits to businesses that cater to the wildlife viewing visitors are taken into account, this figure may be placed in the millions of dollars for Barataria-Terrebonne estuary. Local people seeking family recreational activities travel to beaches at Grand Isle, Elmer's Island, and Fourchon. Many people own camps used for hunting, fishing, and family trips.

BTNEP Connection
Economic Resources

Grade Level
5

Duration
2-3 class periods

Subject Area
science, social studies

Setting
classroom

Vocabulary
eco-tourism

Original Source
"Weaving Our Wetland Economic Web" in BTNEP/LSU AgCenter: *Wetland Functions, Values, and Economic Resources*, Activity 8.

BTNEP Barataria-Terrebonne National Estuary Program
www.btnep.org

Procedures

1. More and more people today look for ways to explore the outdoors in their leisure time. The business of eco-tourism is important to the economy of our area. In fact, this is a growing business that could offer some of you a job. If you were to go into the eco-tourism business, you'd have to know how to attract tourists to your business, whether it is a swamp tour, a charter fishing business, or a hotel or campground.
2. In this activity you will work in groups to promote the wonderful qualities of our wetlands to tourists. Our class will be an advertising company called **Wetland Promotions**. Our job is to create attractive brochures for businesses in the eco-tourism industry to increase tourism in our parish. You can choose to make a brochure for a swamp tour operator, a duck hunting guide service, a guest house, resort proprietor located next to a marina, or the operator of another business dependent on the tourist trade. (Assign students to one of the eco-tourism businesses.)
3. To get started on your brochure, get together in your group to complete the worksheet entitled **Wetlands Promotions Brochure Planning Worksheet**. (Handout **Blackline Master #1**.) Decide who will be responsible for each part of the brochure production, and sign your names next to the headings on the worksheet. In a group of four there should be two students who specialize in the writing and editing and two who are responsible for the graphics and layout. Divide the tasks according to the strengths and talents of your group. Everyone is responsible for the research that goes into the information in your brochure and for bringing in resources.

Blackline Master

1. **Wetlands Promotions Brochure Planning Worksheet**

Assessment

- Students should be assessed on the quality of the content, writing/editing and graphics/layout of their brochure.

Resources

Tradebooks:

Johnson, Rebecca L. 2004. **Journey into an Estuary**. Lerner Publishing Group. 48pp ISBN: 1575055929

Takes readers on a walk at a sheltered bay, showing examples of how the animals and plants of estuaries are connected and dependent on each other and the estuary's mix of fresh and salt water. Age range: 8-12.

Kalman, Bobby. 2002. **What are Wetlands?** Crabtree Publishing.

Investigates some types of wetlands, including swamps, salt marshes, bogs, and flood plains; the many plants and animals that live in wetlands; and the threats to these ecosystems. Reading level: Ages 4-8.

Lawlor, Elizabeth P. and Pat Archer. 2000. **Discover Nature in Water & Wetlands: Things to Know and Things to Do (Discover Nature Series).** Stackpole Books.

Wetlands provide perfect arenas for nature study. Discover Nature in Water and Wetlands explores the properties, processes, and phases of water and the plant and animal life associated with it, from trees, cattails, and ferns to dragonflies, salamanders, turtles, and beavers. With just a few essentials, such as a field notebook, hand lens, and bug box, readers will find both straightforward information and all kinds of activities to uncover the fascinating, diverse ecosystem that surrounds our ponds, swamps, and other watery place. Reading level: Young adult.

McLeish, Ewan. 1995. **Wetlands (Habitats).** Thompson Learning.

A geography book on the world's wetlands showing how they are formed, why they are important, and what can be done to safeguard them for the future. Reading level: Ages 9-12.

CDs

Louisiana Wetland Functions and Values CD developed by LSU AgCenter's Extension Service in conjunction with the U.S. Geological Survey's National Wetlands Center and the Louisiana Department of Natural Resources (DNR). To receive a copy, contact DNR (800/ 267-4019) or order on the Internet at http://www.lacoast.gov.

Blackline Master #1

Wetlands Promotion Brochure Planning Worksheet

Ecotourism business: _____

1. Who is our audience? _____

   _____

2. What is the main message we want to give our audience? _____

   _____

   _____

   _____

3. What is the title of our brochure? _____

   _____

4. What information do we need to collect for our brochure? _____

   _____

   _____

   _____

5. Where can this information be found? _____

   _____

   _____

   _____

   _____

6. What illustrations will we need? _____

   _____

   _____

   _____

   _____

7. Task Assignments (each student signs their name beside the task they are responsible for)

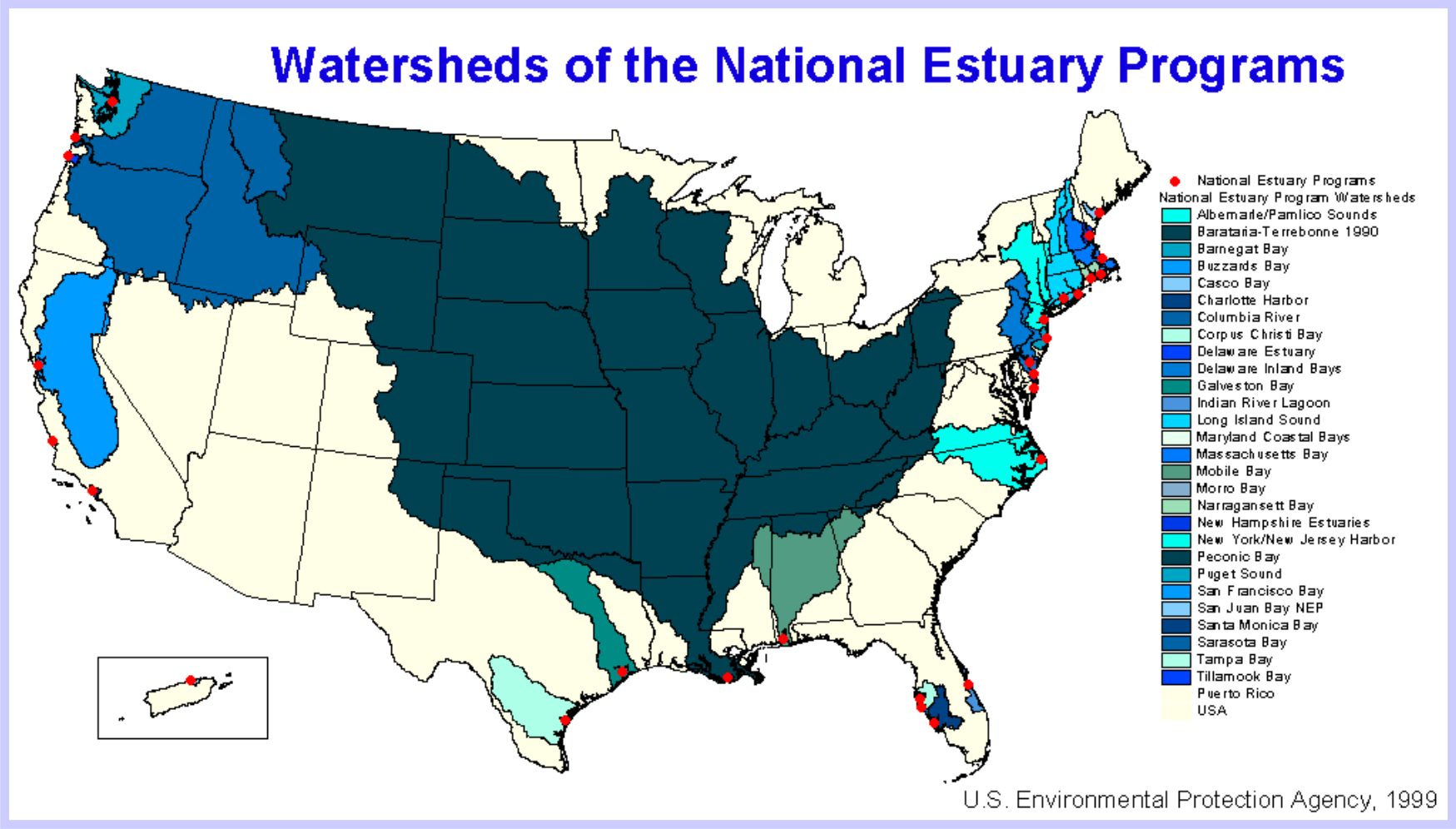
   Writer/Editors: _____ & _____

   Graphic design/layout: _____ & _____

Brochure Design and Production

After planning the brochure, everyone in the group is responsible for gathering information. The writing team then compiles the information into text while the graphic design team, find and generate illustrations and graphics. Next the text is edited and the layout specialists put all the parts together to make an attractive presentation.

The Barataria-Terrebonne National Estuary
drains a large portion of the continental United States.

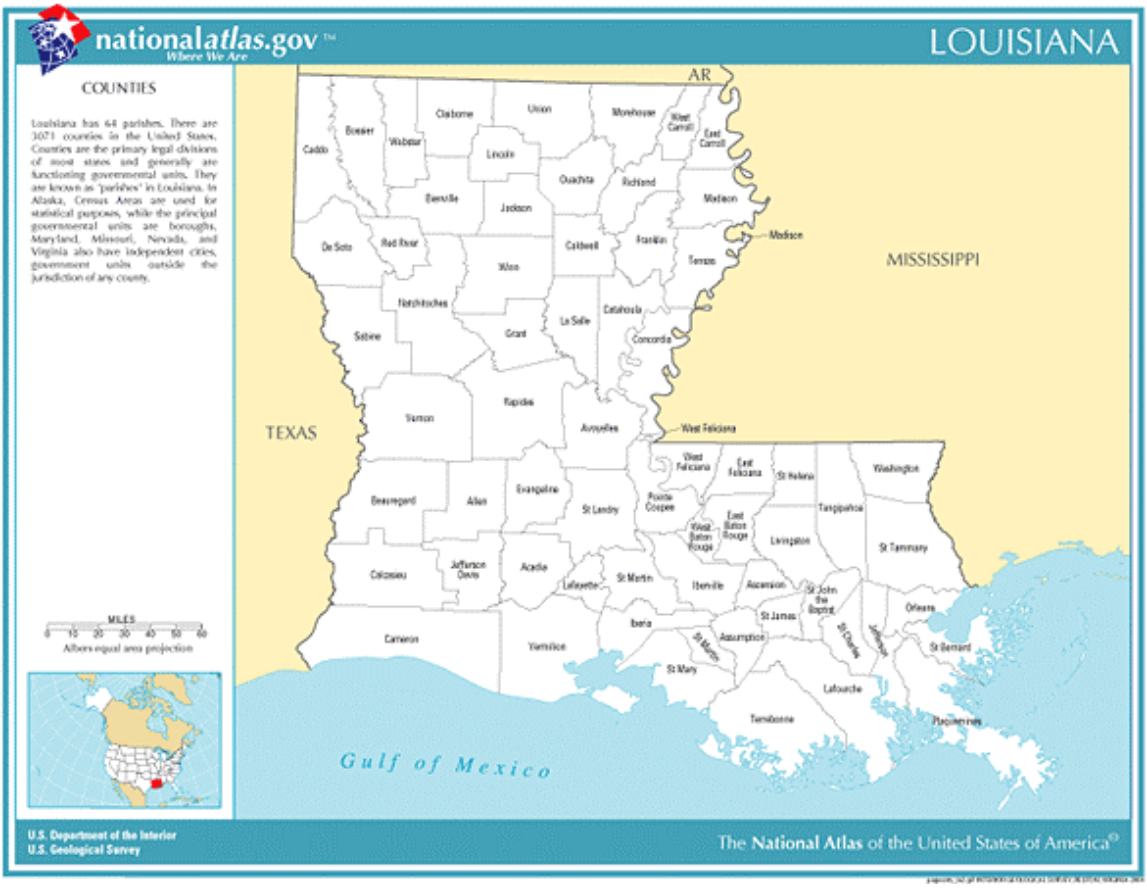


BTNEP
BARATARIA-TERREBONNE NATIONAL ESTUARY PROGRAM

The Barataria-Terrebonne National Estuary is located in the southeaster corner of Louisiana. It includes the land and water between the Mississippi River and the Atchafalaya River. This land mass is the fastest disappearing wetland in the world.

BTNEP
BARATARIA-TERREBONNE NATIONAL ESTUARY PROGRAM

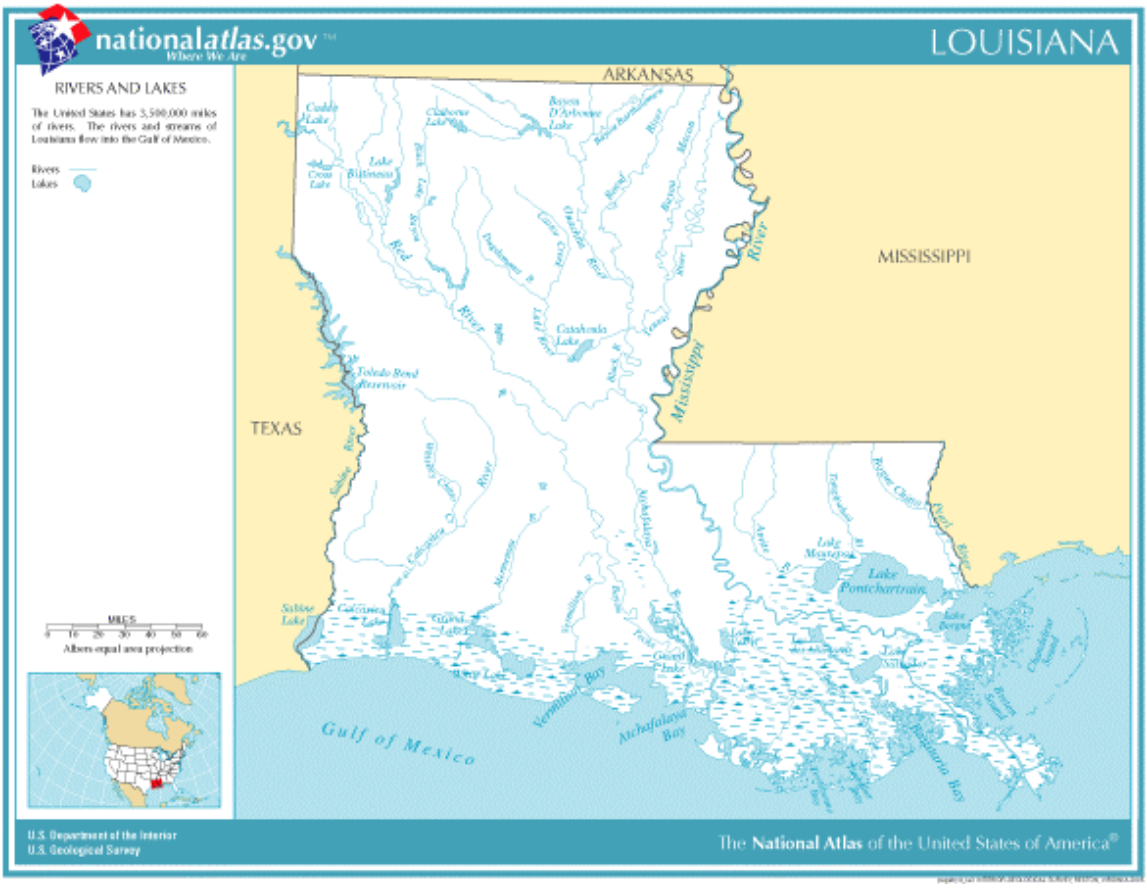
Louisiana Parishes



For additional maps visit the web at

www.nationalatlas.gov

Louisiana Rivers



For additional maps visit the web at

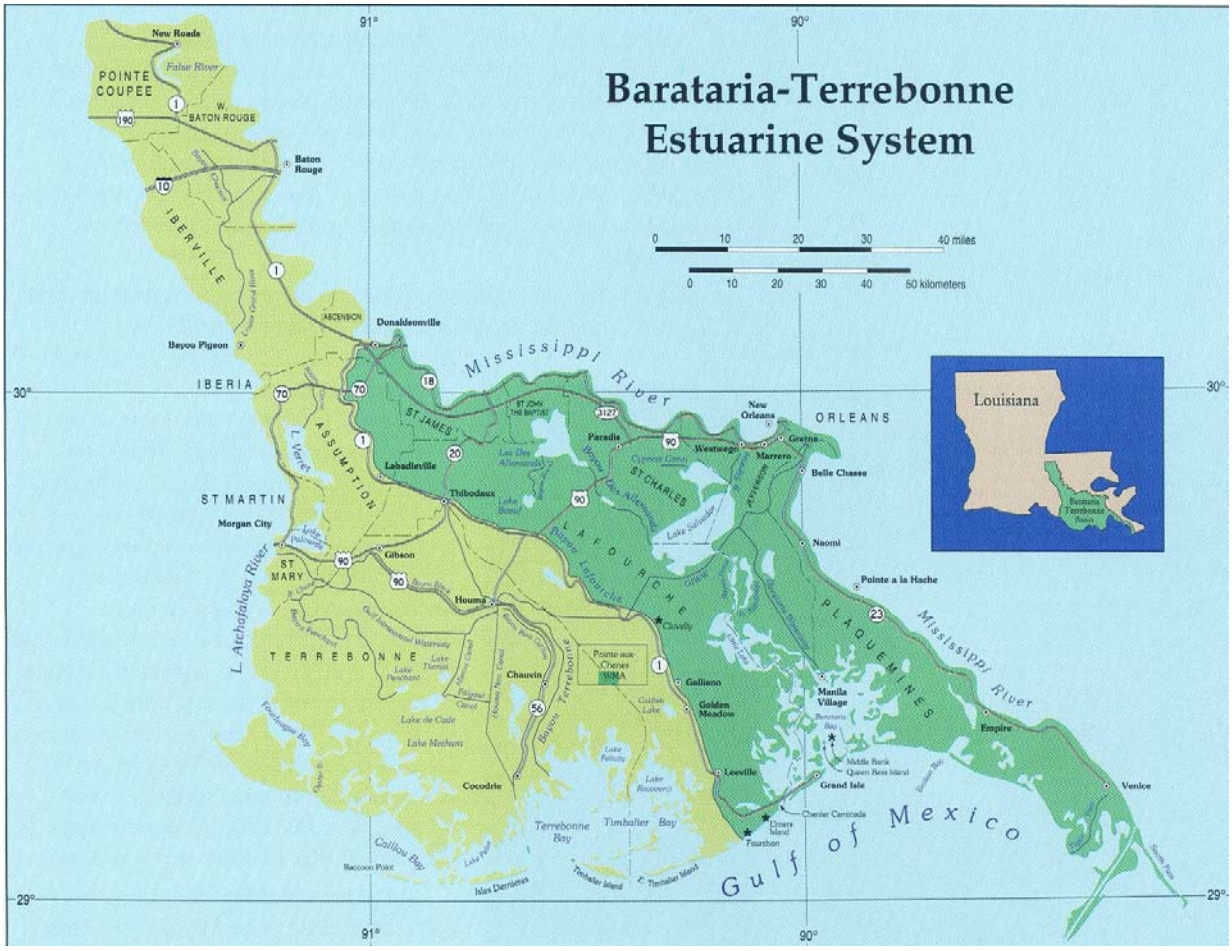
www.nationalatlas.gov

Louisiana Highways

For additional maps visit the web at

www.nationalatlas.gov

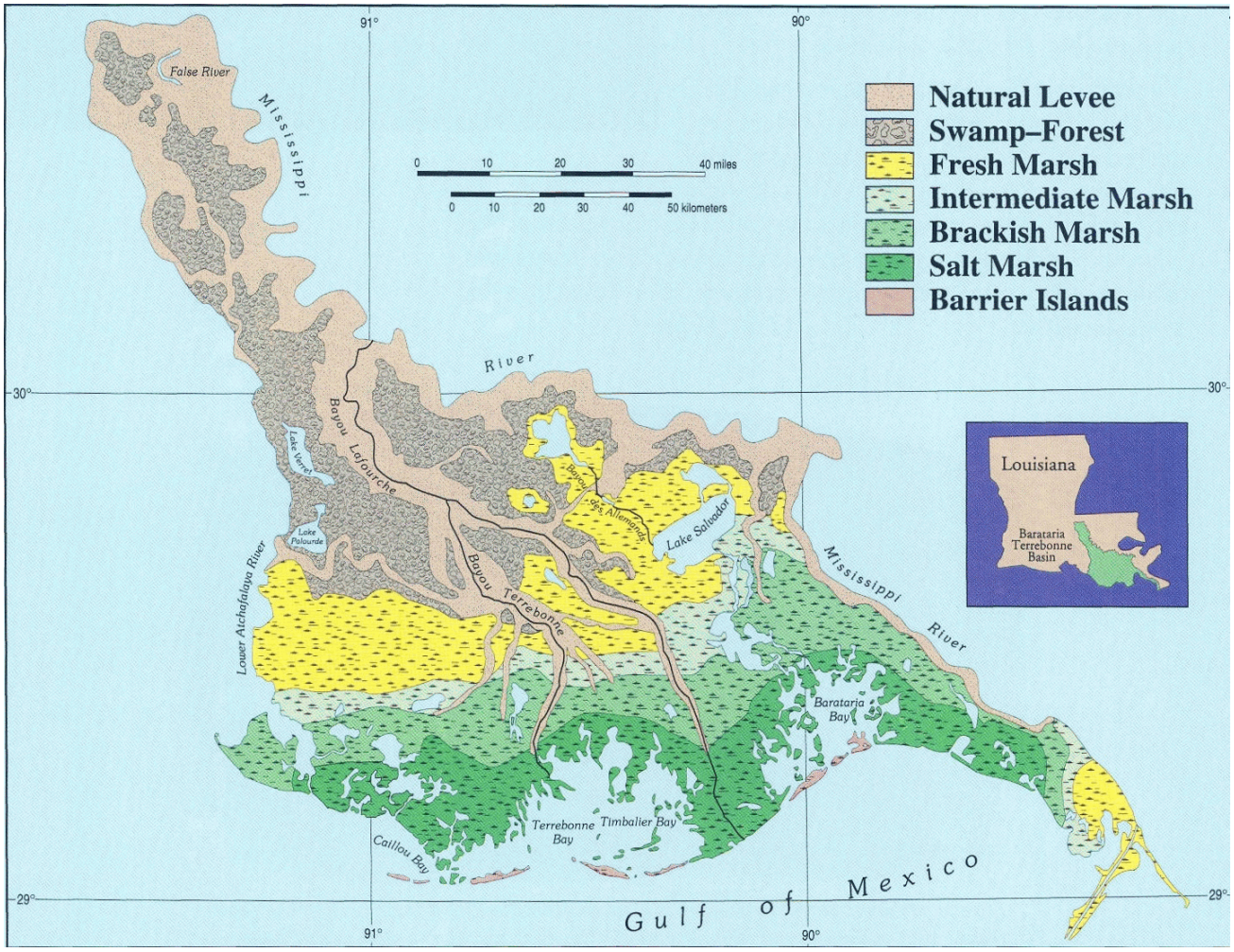
Louisiana Parishes within the Barataria-Terrebonne National Estuary



The Barataria-Terrebonne National Estuary includes
4.2 million acres
in all or part of 15 parishes
between
the Atchafalaya River and the Mississippi River.

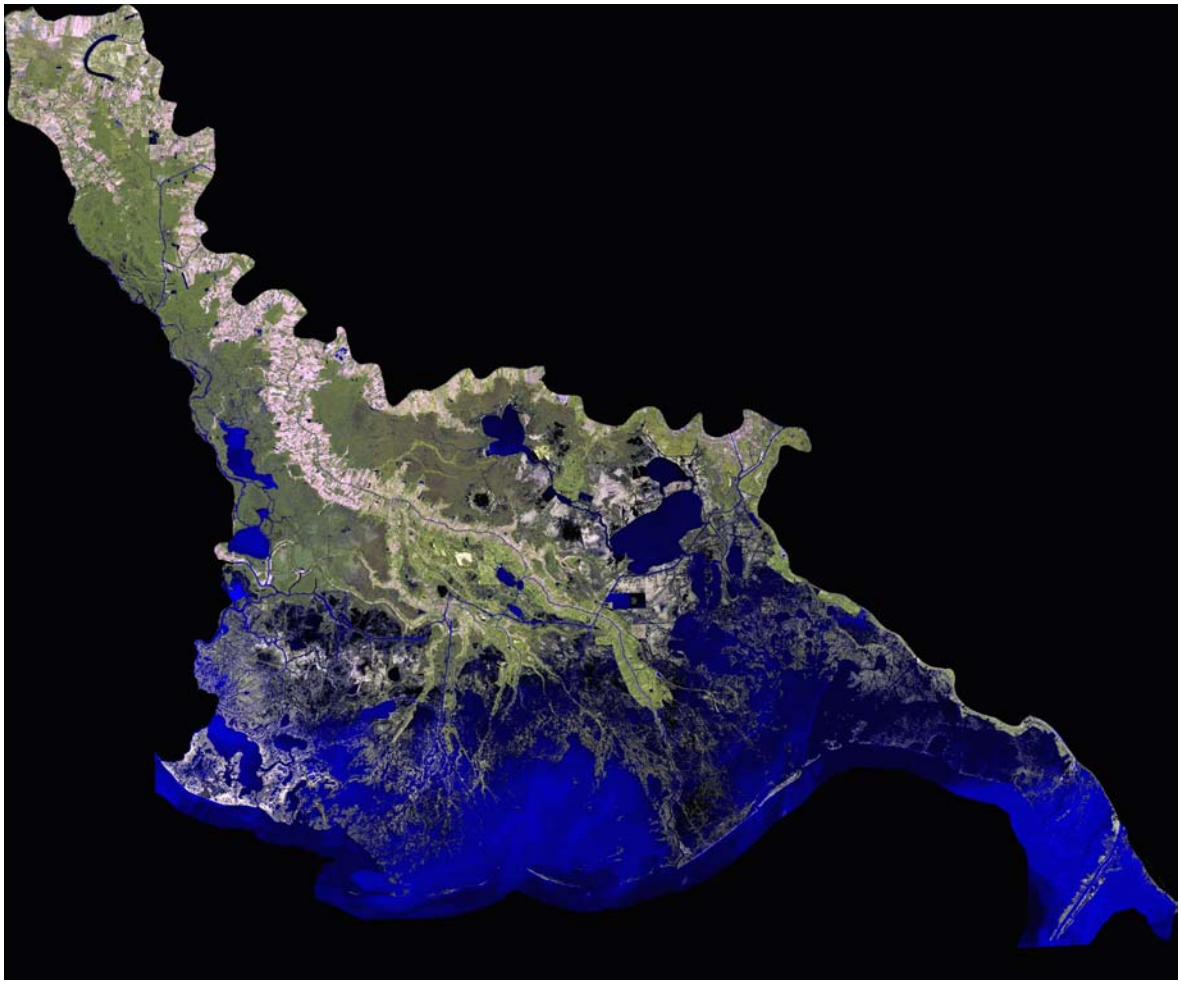
BTNEP
BARATARIA-TERREBONNE NATIONAL ESTUARY PROGRAM

The Barataria-Terrebonne National Estuary contains a variety of different habitats.



BTNEP
BARATARIA-TERREBONNE NATIONAL ESTUARY PROGRAM

This map is called a TM for Thematic Map.
It is made from a mosaic of scenes taken from
the Landsat satellite in 1992 and 1993.
The Louisiana State University
and the Louisiana Geological Society
made the map.



BTNEP
BARATARIA-TERREBONNE
NATIONAL ESTUARY PROGRAM

Grade Level of the Handbook Activities

Activity	#	K	1	2	3	4	5	6	7	8	HS Biol	HS Env Sci
Barrier Islands	1-1	■	■	■								
Where is the B-T Estuary?	1-2	■	■	■								
Habitat Lap Sit	1-3				■	■						
Wetlands in a Pan	1-4				■	■						
We Are Losing Our Wetlands	1-5				■	■						
Wetland Metaphors	1-6								■			
Estuary Ecosystems	1-7								■	■		
Wetland ECO-Bingo	1-8						■					
Wetland Field Trip	1-9						■		■			
Coastal Erosion: Making Sense …I	1-10				■	■	■			■		
Demonstrating Destruction	1-11				■	■	■			■		
Investigating Habitat Change	1-12						■			■		
Issue Analysis & Decision Making	1-13								■	■		■
Coastal Wetlands Needs YOU!	1-14			■	■		■		■		■	
The Tragedy of Isles Dernieres	1-15									■		■
A Bayou Journey in 1880	1-16						■					
The Great Marsh Dilemma	1-17								■		■	■
The Story of a Blue Crab	2-1			■								
Dress a Beaver	2-2		■									
Cajun Creole Meal	2-3				■							
Wetland Webs	2-4			■		■	■					
Marsh Food Web … Game	2-5			■		■	■					
Wetlands Loss = Fisheries Loss	2-6						■			■		
Nutria: Nutrition or Nuisance?	2-7					■	■					
Trading Spaces	2-8						■		■			■
What is Freshwater?	3-1	■	■	■								
The Ideal Filter	3-2						■		■			
The Hurricane's Coming	3-3									■		
Keep It Above Board	3-4			■	■	■						
Exploring the B-T Watershed	3-5									■		
Watershed Drainage…	3-6						■		■	■		
Nutrients: Nitrogen Cycle	3-7					■			■		■	
Nutrients: Phosphorus Cycle	3-8					■			■		■	
The Effect of NO_3 on Plant Growth	3-9								■		■	
Measuring the Bayou's Vital Signs	3-10								■		■	
Swamp Sweep	3-11								■			
A Song on the Bayou	4-1				■	■						
Ask an Expert	4-2					■	■		■	■	■	
Weaving Our Wetland Economic	5-1						■		■			
Wetland Promotions	5-2						■					

Barrier Islands

Learning Objectives

The learner will…

- identify the land and water in two models of a coastline with and without barrier islands.
- state how barrier islands protect the coast of Louisiana.

K: GLE 5	Identify the difference between land and water and locate both on a map or globe (G-1B-E1)
1: GLE 6	Identify Earth's various physical features (e.g., oceans, islands, mountains, rivers) (G-1B-E1)
2: GLE 4	Identify geographical features in the local region (G-1A-E2)
2: GLE 15	Explain ways in which people in the local community depend on the physical environment to satisfy basic needs (G-1D-E1)

Louisiana Grade Level Expectations (Social Studies)

K: GLE 19	Write using developmental/inventive spelling, supported by drawing or dictation to the teacher to express ideas (ELA-2-E1)
1: GLE 31	Write for various purposes, including: responses that follow simple formats (ELA-2-E6)
2: GLE 26	Write for various purposes, including: informal writing (ELA-2-E6)

Louisiana Grade Level Expectations (ELA)

Where is the Barataria-Terrebonne Estuary?

Learning Objectives

The learner will…

- distinguish between land and water on a globe.
- collect data on land/water proportion on a globe by randomly locating their thumb on a globe during a globe toss game.
- graph the class data from the globe toss game and create a circle graph.
- identify the location of marsh, major rivers, bays, barrier islands, and the Gulf of Mexico on an enlarged map and then on an individual map.
-

Louisiana Grade Level Expectations (Math)

K: GLE-21	Collect and organize concrete data using tally mark charts (D-1-E)
K: GLE-4	Identify the numerals for the numbers 0 through 20 (N-1-E) (N-3-E)
1: GLE-37	Given a set of data, construct and read information from bar graphs and **charts** (D-1-E) (D-2-E)
2: GLE-25	Collect and organize data using observations, surveys, and experimentation (D-1-E)

Louisiana Grade Level Expectations (Social Studies)

K: GLE- 5	Identify the difference between land and water and locate both on a map or globe (G-1B-E1)
1: GLE- 6	Identify Earth's various physical features (e.g., oceans, islands, mountains, rivers) (G-1B-E1)
2: GLE -4	Identify geographical features in the local region (G-1A-E2)

Habitat Lap Sit

Learning Objectives

The learner will…

- identify the four components of a healthy habitat.
- understand that the success of an animal species depends on the correct proportion of all the necessary components of the habitat.
- recognize that all things are interrelated and that impacts on one habitat component affect all other components and occupants of the habitat.

Louisiana Grade Level Expectations (Social Studies)

4: GLE-16	Identify ways in which people in the US depend upon and modify the physical environment (G-1D-E1)
4: GLE-18	Describe the importance of specific natural resources to human survival and human endeavors (G-1D-E4)

Wetland in a Pan

Learning Objectives

The learner will…

- describe the importance of wetlands in flood control.
- appreciate the ability of wetlands to filter sediment and other pollutants.
- describe how wetlands help to control shoreline erosion.

Louisiana Grade Level Expectations (Social Studies)

3: GLE-9	Describe and compare the physical characteristics of various regions of Louisiana (G-1B-E1)
3: GLE-21	Identify natural resources in Louisiana and describe their uses and importance (G-1D-E4)
4: GLE-16	Identify ways in which people in the US depend upon and modify the physical environment (G-1D-E1)
4: GLE-17	Identify natural disasters, their cause, area prone to them, and how those disasters affect people and the environment (G-1D-E3)

We Are Losing Our Wetlands

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 (Math)

3: GLE-8	Recognize, select, connect, and use operations, operational words, and symbols to solve real-life situations (N-5-E) (N-6-E) (N-9-E)
3: GLE-28	Estimate length, weight, and capacity (M-3-E)
3: GLE-45	Use manipulatives to discuss the probability of an event (D-5-E).
4: GLE-14	Solve real-life problems, including those in which some information is not given (N-9-E)

Louisiana Grade Level Expectations (Social Studies)

4: GLE-17	Identify natural disasters, their cause, area prone to them, and how those disasters affect people and the environment (G-1D-E3)

Wetland Metaphors

Learning Objectives

The learner will…

- describe the characteristics of a wetland.
- identify the ecological functions of a wetland.
- use metaphors to describe the functions of a wetland.

Louisiana Grade Level Expectations (Social Studies)

7: GLE-66	Identify major technological developments related to land, water, and transportation and explain how they transformed the economy, created international markets and affected the environment (H-1B-M10)
8: GLE-5	Describe and analyze the distinguishing physical and/or human characteristics of Louisiana regions (G-1B-M1)
8: GLE-7	Explain how or why specific regions are changing as a result of physical phenomena (e.g., changes in the coastal wetlands) (G-1B-M2)
8: GLE-8	Identify and describe factors that cause a Louisiana region to change (E.g., natural occurrences, disasters, migration) (G-1B-M3)
8: GLE-16	Analyze the distribution and uses of Louisiana's natural resources (G-1D-M3)

Estuary Ecosystems

Learning Objectives **Completed**

Wetland ECO-Bingo

Learning Objectives

The learner will…

- define the terms “ecosystem” and “habitat.”
- identify the many habitats of the Barataria-Terrebonne estuarine ecosystem.
- identify the components of a habitat and an ecosystem.

Louisiana Grade Level Expectation (Social Studies)

5: GLE-7	Identify ways in which locations and physical features influence the development or life in a region of the US (G-1B-M1)

Wetland Field Trip
How Valuable is This Wetland?

Learning Objective
The learner will…
- visit and use observation to assess the site's functions and values.

Louisiana Grade Level Expectations (Social Studies)

5: GLE-7	Identify ways in which locations and physical features influence the development or life in a region of the US (G-1B-M1)

Coastal Land Loss:
Making Sense of it All

Learning Objectives

The learner will…

- classify causes of coastal land loss into "natural" and "human".
- organize the causes and effects of land loss in Barataria-Terrebonne into a concept map.
- decorate their concept maps, present them to their peers and display them in the school.

Louisiana Grade Level Expectations (Social Studies)

3: GLE-3	Interpret a graph, chart, and diagram (G-1A-E1)
3: GLE-5	Locate major geographic features of Louisiana on a map (G-1A-E2)
3: GLE-11	Describe how people and the physical environment have changed over time in Louisiana based on given information (G-1B-E4)
3: GLE-13	Identify examples of physical process affecting Louisiana (coastal erosion, river changes) G-1C-E1)
3: GLE-19	Identify and explain ways in which people in Louisiana modify the physical environment to meet basic needs and achieve certain purposes (G-1-D-E1)
4: GLE-16	Identify ways in which people in the US depend upon and modify the physical environment (G-1D-E1)
4: GLE-18	Describe the importance of specific natural resources to human survival and human endeavors (G-1D-E4)
5: GLE-4	Locate major landforms and geographic features, places, and bodies of water/waterways on a map of the US (G-1A-M2)
5: GLE-16	Identify the natural resources used by people in the US (G-1D-M3)
8: GLE-2	Locate major landforms and geographic features, places, and bodies of water/waterways on a map of Louisiana (G-1A-M2)
8: GLE-7	Explain how or why specific regions are changing as a result of physical phenomena (G-1B-M3)
8: GLE-8	Identify and describe the factors that cause a Louisiana region to change (G-1B-M3)
8: GLE-14	Analyze, evaluate, and predict consequences of environmental modifications on Louisiana landforms, natural resources, and plant or animal life (G-1D-M1)
8: GLE-15	Analyze the benefits and challenges of the Louisiana physical environments on its inhabitants (G-1D-M2)
8: GLE-16	Analyze the distribution and uses of Louisiana's natural resources (G-1D-M3)

Louisiana Grade Level Expectations (ELA)

4: GLE-19	Demonstrate understanding of information in grade-appropriate texts using a variety of strategies, including: Identifying cause-effect relationships in texts and real-life situations (ELA-7-E4)

5: GLE-17	Analyze grade-appropriate print and nonprint texts using various reasoning skills, including: Identifying cause and effect (ELA-7-M4)
8: GLE-14	Analyze grade-appropriate print and nonprint texts using various reasoning skills, including: Identifying cause and effect (ELA-7-M4)

Demonstrating Destruction

Learning Objectives

The learner will…

- research a causal factor of coastal land loss.
- plan and design a demonstration to show how this factor causes coastal land loss.
- use the demonstration to explain to the class how the researched causal factor contributes to coastal land loss.

Louisiana Grade Level Expectations (Social Studies)

3: GLE-11	Describe how people and the physical environment have changed over time in Louisiana based on given information (G-1B-E4)
3: GLE-13	Identify examples of physical process affecting Louisiana (coastal erosion, river changes) G-1C-E1)
3: GLE-19	Identify and explain ways in which people in Louisiana modify the physical environment to meet basic needs and achieve certain purposes (G-1-D-E1)
4: GLE-16	Identify ways in which people in the US depend upon and modify the physical environment (G-1D-E1)
4: GLE-18	Describe the importance of specific natural resources to human survival and human endeavors (G-1D-E4)
5: GLE-4	Locate major landforms and geographic features, places, and bodies of water/waterways on a map of the US (G-1A-M2)
8: GLE-2	Locate major landforms and geographic features, places, and bodies of water/waterways on a map of Louisiana (G-1A-M2)
8: GLE-7	Explain how or why specific regions are changing as a result of physical phenomena (G-1B-M3)
8: GLE-8	Identify and describe the factors that cause a Louisiana region to change (G-1B-M3)
8: GLE-14	Analyze, evaluate, and predict consequences of environmental modifications on Louisiana landforms, natural resources, and plant or animal life (G-1D-M1)
8: GLE-15	Analyze the benefits and challenges of the Louisiana physical environments on its inhabitants (G-1D-M2)
8: GLE-16	Analyze the distribution and uses of Louisiana's natural resources (G-1D-M3)

Louisiana Grade Level Expectations (ELA)

3: GLE-45	Locate information using organizational features of a variety of resources (ELA-5-E1)
3: GLE-46	Locate information from multiple sources, including books, periodicals, videotapes, Web sites, and CD-ROMS (ELA-5-E2
4: GLE-41	Locate information using organizational features of a variety of resources (ELA-5-E1)
4: GLE-42	Locate information using a broad variety of reference sources, including almanacs, atlases, newspapers, magazines, and brochures (ELA-5-E1)
5: GLE-17	Analyze grade-appropriate print and nonprint texts using

	various reasoning skills (ELA-7-M4)
8: GLE-39	Analyze grade-appropriate print and nonprint texts using various reasoning skills (ELA-7-M4)
8: GLE-40	Locate and integrate information from a variety of grad-appropriate resources (ELA-5-M2)

Investigating Habitat Change

Learning Objectives

The learner will…

- analyze the habitat changes shown on Geographic Information Systems (GIS) maps and Corps of Engineers land loss charts.
- make predictions about future changes, given information about choices for habitat restoration.

Louisiana Grade Level Expectations (ELA)

5: GLE-14	Use technical information and other available resources to solve problems (ELA-7-M2)
5: GLE-17	Analyze grade-appropriate print and nonprint texts using various reasoning skills (ELA-7-M4)
5- GLE-48	Interpret information from a variety of grade-appropriate sources, including timelines, charts, schedules, tables, diagrams, and maps (ELA-5-M6)
8: GLE-14	Analyze grade-appropriate print and nonprint texts using various reasoning skills (ELA-7-M4)
8: GLE-43	Generate grade-appropriate research reports that include information presented in a variety of forms (ELA-5-M3)
8: GLE-46	Locate information from multiple sources, including books, periodicals, videotapes, Web sites, and CD-ROMS (ELA-5-M6)

Issue Analysis & Decision Making

Learning Objectives

The learner will…

- research viable coastal restoration methods using published documents and the Internet.
- use issue analysis and conflict resolution methods to make a group decision about the merits of a freshwater/sediment diversion project.
- develop and act out a role-playing skit of a CWPPRA meeting to discuss a freshwater/sediment diversion project.

Louisiana Grade Level Expectations (Social Studies)

7: GLE-1	Analyze various types of maps, charts, graphs, and diagrams related to U.S. history (G-1A-M2)
7: GLE-66	Identify major technological developments related to land, water, and transportation and explain how they transformed the economy, created international markets, and affected the environment (H-1B-M10)
8: GLE-7	Explain how or why specific regions are changing as a result of physical phenomena (G-1B-M3)
8: GLE-8	Identify and describe the factors that cause a Louisiana region to change (G-1B-M3)
8: GLE-14	Analyze, evaluate, and predict consequences of environmental modifications on Louisiana landforms, natural resources, and plant or animal life (G-1D-M1)
8: GLE-15	Analyze the benefits and challenges of the Louisiana physical environments on its inhabitants (G-1D-M2)
8: GLE-16	Analyze the distribution and uses of Louisiana's natural resources (G-1D-M3)
GEOGR: GLE-7	Analyze, interpret, and use information in charts, diagrams, and graphs to explain geographic issues (G-1A-H1)

Louisiana Grade Level Expectations (ELA)

7: GLE-11	Use technical information and other available resources to solve problems (ELA-7-M2)
7: GLE-14	Analyze grade-appropriate print and nonprint texts using various reasoning skills (ELA-7-M4)
7: GLE-35	Deliver formal and informal persuasive presentations (ELA-4-M4)
7: GLE-40	Locate and integrate information from a variety of grade-appropriate resources (ELA-5-M2)
7: GLE-46	Interpret information from a variety of graphic organizers including timelines, charts, schedules, tables, diagrams, and maps in grade-appropriate sources (ELA-5-M6)
8: GLE-14	Analyze grade-appropriate print and nonprint texts using various reasoning skills (ELA-7-M4)
8: GLE-35	Deliver grade-appropriate persuasive presentations (ELA-4-M4)

8: GLE-43	Generate grade-appropriate research reports that include information presented in a variety of forms (ELA-5-M3)
8: GLE-46	Locate information from multiple sources, including books, periodicals, videotapes, Web sites, and CD-ROMS (ELA-5-M6)

Coastal Wetlands Need YOU!

Learning Objectives

The learner will…

- identify ways they can help reduce coastal erosion and habitat destruction.
- design a public education brochure explaining how Louisiana residents can contribute to the solutions of coastal land loss.

Louisiana Grade Level Expectations (ELA)

7: GLE-4	Draw conclusions and make inferences in oral and written responses about ideas and information in grade-appropriate texts (ELA-1-M3)
7: GLE-5	Interpret ideas and information in a variety of texts, including periodical articles, editorial, and lyrics, and make connections to real-life situations and other texts (ELA-1-M4)
7: GLE-9	Demonstrate understanding of information in grade-appropriate texts using a variety of strategies (ELA-7-M1)
7: GLE-14	Analyze grade-appropriate print and nonprint texts using various reasoning skills (ELA-7-M4)

The Tragedy of Isles Dernieres

Learning Objectives

The learner will…

- research the history of Isles Dernieres and construct a timeline.
- write an account of what they learned from their research on one aspect of the history or science of Isles Dernieres.

Louisiana Grade Level Expectations (Social Studies)

8: GLE-5	Describe and analyze the distinguishing physical and/ or human characteristics of Louisiana regions (G-1B-M1)
8: GLE 7	Explain how or why specific regions are changing as a result of physical phenomena (G-1B-M3)
8: GLE-8	Identify and describe factors that cause a Louisiana region to change (G-1B-M3)

Louisiana Grade Level Expectations (ELA)

8: GLE-5	Interpret ideas and information in a variety of texts, including periodical articles, editorial, and lyrics, and make connections to real-life situations and other texts (ELA-1-M4)
8: GLE-20	Use the various modes to write compositions, including: • essays based on a stated opinion • fictional narratives (ELA-2-M4)
8: GLE-22	Write for various purposes (ELA-2-M6)

A Bayou Journey in 1880

Learning Objective

The learner will…

- understand how the Louisiana landscape has changed over the last 120 years.

Louisiana Grade Level Expectation (ELA)

5: GLE-38	Demonstrate active listening strategies (ELA-4-M4)

The Great Marsh Dilemma

Learning Objectives

The learner will…

- take roles of members of the community who have an interest in the future of a large tract of marsh land and meet to make their recommendations.
- take roles of parish police jurors charged with the task of developing a management plan for the land.
- solve the problem of a lawsuit brought against the police jury by a party dissatisfied with the management plan.

Louisiana Grade Level Expectations (Social Studies)

7: GLE-4	Explain ways in which goals, cultures, interests, inventions, and technological advances have affected perception and uses of places or regions in the US (G-1B-M4)
7: GLE-5	Explain patterns of rural/urban migration and the positive and negative consequences of urban development in the US (Louisiana) (G-1C-M3)
HS World Geo GLE: 40	Analyze or evaluate strategies for dealing with environmental challenges (G-1D-H2)

Louisiana Grade Level Expectations (ELA)

7: GLE-4	Draw conclusions and make inferences in oral and written responses about ideas and information in grade-appropriate texts (ELA-1-M3)
7: GLE-5	Interpret ideas and information in a variety of texts, including periodical articles, editorial, and lyrics, and make connections to real-life situations and other texts (ELA-1-M4)
7: GLE-9	Demonstrate understanding of information in grade-appropriate texts using a variety of strategies (ELA-7-M1)
7: GLE-10	Explain the relationship between real-life experiences and texts to generate solutions to problems (ELA-7-M2)
7: GLE-14	Analyze grade-appropriate print and nonprint texts using various reasoning skills (ELA-7-M4)
7: GLE-32	Adjust volume and inflection to suit the audience and purpose of presentations (ELA-4-M3)
7: GLE-35	Deliver formal and informal persuasive presentations (ELA-4-M4)
7: GLE-38	Participate in group and panel discussions (Ela-4-M6)
9: GLE-5	Explain ways in which ideas and information in a variety of texts connect real-life situations and other texts (ELA-1-H4)
9: GLE-11	Demonstrate understanding of information in grade-appropriate texts using a variety of strategies (ELA-7-H1)

9: GLE-33	Deliver clear, coherent, and concise oral presentation about information and ideas in texts (ELA-4-H4)
9: GLE-35	Participate in group and panel discussions (ELA-4-H6)
10:GLE-11	Demonstrate understanding of information in grade-appropriate texts using a variety of strategies (ELA-7-H1)
10: GLE-12	Solve problems using reasoning skills (ELA-7-H2)
10: GLE-15	Analyze information within and across grade-appropriate texts using various reasoning skills (ELA-7-H4)
10: GLE-36	Deliver clear, coherent, and concise oral presentation about information and ideas in texts (ELA-4-H4)
10: GLE-38	Participate in group and panel discussions (ELA-4-H6)
11,12: GLE-13	Analyze information within and across grade-appropriate print and nonprint texts using various reasoning skills (ELA-7-H4)
11,12: GLE-31	Deliver oral presentation (ELA-4-H4)
11,12: GLE-33	Participate in group and panel discussions (ELA-4-H6)

The Story of a Blue Crab

Learning Objectives

The learner will…

- locate the places in the estuary where the blue crab spends portions of its life cycle.
- distinguish between male and female blue crabs.

Louisiana Grade Level Expectations (Social Studies)

2: GLE-4	Identify geographical features in the local region (G-1A-E2)
2: GLE-15	Explain ways in which people in the local community depend on the physical environment to satisfy basic needs (G-1D-E1)

Understanding Animal Adaptations

Learning Objective	Completed

The Louisiana Meal

Learning Objectives

The learner will…

- create a meal that includes representatives from each of the five groups on the food pyramid.
- locate at least one recipe that incorporates a native or farmed food from Louisiana.
- explain how seafood and agricultural products are renewable resources and explain how the habitats of these food sources needs to be protected.

Louisiana Grade Level Expectations (Social Studies)

3: GLE-16	Identify and compare customs, celebrations, and traditions of various cultural groups (G-1C-E4)
3: GLE- 21	Identify natural resources in Louisiana and describe their uses and importance (G-1D-E4)

Wetland Webs

Learning Objective

The learner will…

- create a physical representation of a wetland food web and identify the importance of each component of the web.

Louisiana Grade Level Expectations (Social Studies)

2: GLE-15	Identify ways In which people in the community depend on the physical environment to satisfy basic needs (G-1D-E1)
4: GLE 18	Describe the importance of specific natural resources to human survival and human endeavors (G-1D-E4)

Marsh Food Web Rummy

Learning Objective

The learner will…

- classify wetland organisms into groups of producers, herbivores, carnivores, omnivores, scavengers and detritivores.

Louisiana Grade Level Expectations (Social Studies)

2: GLE-15	Identify ways In which people in the community depend on the physical environment to satisfy basic needs (G-1D-E1)
4: GLE 18	Describe the importance of specific natural resources to human survival and human endeavors (G-1D-E4)

Wetlands Loss = Fisheries Loss

Learning Objectives

The learner will…

- explore the relationship between marsh breakup and fisheries productivity.
- simulate marsh breakup to obtain data for drawing a curve to show the relationship.

Louisiana Grade Level Expectations (ELA)

5: GLE-8	Interpret ideas and information in a variety of texts and make connections to real-life situations and other texts (ELA-1-M4)
5: GLE-25	Write for various purposes (ELA-2-M-6)
8: GLE-5	Interpret ideas and information in a variety of texts and make connections to real-life situations and other texts (ELA-1-M4)
8: GLE-14	Analyze grade-appropriate print and nonprint texts using various reasoning skills (ELA-7-M3)
8: GLE-22	Write for various purposes (ELA-2-M6)
8: GLE-46	Interpret information from a variety of graphic organizers including timelines. Charts, schedules, tables, diagrams, and maps in grade-appropriate sources (ELA-5-M6)

Louisiana Grade Level Expectations (Math)

5: GLE-28	Use various types of charts and graphs, including double bar graphs, to organize, display, and interpret data and discuss patterns verbally and writing (D-1-M) (D-2-M)
5: GLE-33	Fill in missing elements in sequences of designs, number patterns, positioned figures, and qualities of objects (P-1-M)
8: GLE-30	Construct, interpret, and use scale drawings in real-life situation (G-5-M) (M-6-M) (N-8-M)
8: GLE-39	Analyze and make predictions from discovered data patterns (D-2-M)

Nutria:
Nutrition or Nuisance

Learning Objectives

The learner will…

- gather information about nutria, including the nutritional value of nutria meat.
- draw a food web for nutria that includes humans as a consumer of nutria meat.
- create a publicity package for the purpose of advertising a nutria food product.
- make a simple dish using nutria meat.

Louisiana Grade Level Expectations (Social Studies)

4: GLE 18	Describe the importance of specific natural resources to human survival and human endeavors (G-1D-E4)
4: GLE-42	Describe the basic concept of market (exchange of goods/services between buyers and sellers) and identify ways of transporting goods (E-1A-E9)
5: GLE-16	Identify the natural resources used by people in the US (G-1D-M3)

Louisiana Grade Level Expectations (ELA)

4: GLE-19	Demonstrate understanding of information in grade-appropriate texts using a variety of strategies (ELA-7-E4)
4: GLE-22	Identify an audience for a specific writing assignment and select appropriate vocabulary, details, and information to create a tone and set the mood and to affect or manipulate the intended audience (ELA-2-E2)
5: GLE-8	Interpret ideas and information in a variety of texts and make connections to real-life situations and other texts (ELA-1-M4)
5: GLE-25	Write for various purposes (ELA-2-M-6)
5: GLE-45	Paraphrase or summarize information from a variety of sources (ELA-5-E4)

Trading Spaces: Invasive Species

Learning Objectives

The learner will…

- identify several major invasive species in their ecosystem.
- research the history of how they were introduced to Louisiana.
- state the affects that these invasive species have on the environment.

Louisiana Grade Level Expectations (Social Studies)

5: GLE-16	Identify the natural resources used by people in the US (G-1D-M3)
7: GLE-5	Explain patterns of rural/urban migration and the positive and negative consequences of urban development in the US (G-1C-M3)

Louisiana Grade Level Expectations (ELA)

5: GLE-8	Interpret ideas and information in a variety of texts and make connections to real-life situations and other texts (ELA-1-M4)
5: GLE-25	Write for various purposes (ELA-2-M-6)
5: GLE-39	Deliver formal and informal presentations for a variety of purposes (ELA-4-M4)
5: GLE-41	Participate in group and panel discussions (ELA-4-M6)
7: GLE-4	Draw conclusions and make inferences in oral and written responses about ideas and information in grade-appropriate texts (ELA-1-M3)
7: GLE-5	Interpret ideas and information in a variety of texts, including periodical articles, editorial, and lyrics, and make connections to real-life situations and other texts (ELA-1-M4)
7: GLE-9	Demonstrate understanding of information in grade-appropriate texts using a variety of strategies (ELA-7-M1)
7: GLE-10	Explain the relationship between real-life experiences and texts to generate solutions to problems (ELA-7-M2)
7: GLE-14	Analyze grade-appropriate print and nonprint texts using various reasoning skills (ELA-7-M4)
7: GLE-36	Deliver grade-appropriate research-based presentations (ELA-4-M4)
7: GLE-38	Participate in group and panel discussions (ELA-4-M6)
9: GLE-35	Participate in group and panel discussions (ELA-4-H6)
10:GLE-11	Demonstrate understanding of information in grade-appropriate texts using a variety of strategies (ELA-7-H1)
10: GLE-12	Solve problems using reasoning skills (ELA-7-H2)
10: GLE-15	Analyze information within and across grade-appropriate texts using various reasoning skills (ELA-7-H4)
10: GLE-36	Deliver clear, coherent, and concise oral presentation about information and ideas in texts (ELA-4-H4)
10: GLE-38	Participate in group and panel discussions (ELA-4-H6)
11,12: GLE-13	Analyze information within and across grade-appropriate print and nonprint texts using various reasoning skills (ELA-7-H4)

11,12: GLE-31	Deliver oral presentation (ELA-4-H4)
11,12: GLE-33	Participate in group and panel discussions (ELA-4-H6)

What is Freshwater and What is Saltwater?

Learning Objectives

The learner will…

- use his/her five senses to describe the difference between freshwater and saltwater.
- describe and illustrate what happens after water evaporates from a saltwater and freshwater solution.
- Identify the Gulf of Mexico, rivers, bays and estuaries on a map of Louisiana and whether they contain freshwater, saltwater, or a mix of both fresh and saltwater.

Louisiana Grade Level Expectations (Social Studies)

K: GLE-4	Identify the difference between land and water and locate both on a map or globe (G-1B-E1)
1: GLE-6	Identify Earth's various physical features (oceans, islands, mountains, rivers) (G-1B-E1)
2: GLE-4	Identify geographical features in the local region (G-1A-E2)

Louisiana Grade Level Expectations (ELA)

K: GLE-19	Write using developmental/inventive spelling, supported by drawing or dictation to the teacher to express ideas (ELA-2-E1)
1: GLE-31	Write for various purposes (ELA-2-M-6)
1: GLE-59	Record data through pictures or words (ELA-5-E3)
2: GLE-24	Develop grade-appropriate compositions (ELA-2-E6)
2: GLE-26	Write for various purposes (ELA-2-M-6)
2: GLE-53	Tell and write about the sources of learned information (ELA-5-E5)

The Ideal Filter

Learning Objectives

The learner will…

- design a filter using a variety of materials and recycled 2-liter drink bottles.
- compete to see whose filter works the best in cleaning dirty water.

Louisiana Grade Level Expectations (Social Studies)

5: GLE-16	Identify the natural resources used by people in the US (G-1D-M3)
7: GLE-66	Identify major technological developments related to land, water, and transportation and explain how they transformed the economy, created international markets, and affected the environment (H-1B-M10)

The Hurricane's Coming

Learning Objective

The learner will…

- model the function and value of wetlands in storm protection.

Louisiana Grade Level Expectations (Social Studies)

8: GLE-2	Locate major landforms and geographic features, places, and bodies of water/waterways on a map of Louisiana (G-1A-M2)
8: GLE-8	Identify and describe factors that cause a Louisiana region to change (G-1B-M3)

Keep It Above Board

Learning Objectives

The learner will…

- develop a decomposition timeline illustrating how long it takes for various types of common trash to deteriorate in the environment.

Louisiana Grade Level Expectations (Social Studies)

3: GLE-46	Complete a timeline based on given information (H-1A-E1)
3: GLE-47	Use information in a map, table, or graph to describe the past (H-1A-E3)

Louisiana Grade Level Expectations (ELA)

1: GLE-59	Record data through pictures or words (ELA-5-E3)
2: GLE-54	Locate and read information on a chart, graph, diagram, map, and simple timeline (ELA-5-E6)
3: GLE-52	Locate information found in graphic organizers such as timelines, charts, graphs, schedules, tables, diagrams, and maps (ELA-5-E6)

Exploring the Barataria-Terrebonne Watershed

Learning Objectives

The learner will…

- become familiar with the geography of their community in relation to the watershed.
- examine topographical maps of their community in relation to the watershed.
- locate and mark their homes, school, waterways, sewage treatment plant and any industrial plant on the topographic map.
- make observations about the watershed patterns and the locations of the various features.

Louisiana Grade Level Expectation (Social Studies)

8: GLE-2	Locate major landforms and geographic features, places, and bodies of water/waterways on a map of Louisiana (G-1A-M2)
8: GLE-3	Construct a chart or diagram to display geographical information in an organized way (G-1A-M2)
8: GLE-14	Analyze, evaluate, and predict consequences of environmental modifications on Louisiana landforms, natural resources, and plant or animal life (G-1D-M1)
8: GLE-17	Identify a contemporary Louisiana geographic issue, and research the possible solutions (G-1D-M4)

Louisiana Grade Level Expectations (ELA)

8: GLE-4	Draw conclusions and make inferences in print and nonprint responses about ideas and information in grade-appropriate texts (ELA-1-M3)
8: GLE-5	Interpret ideas and information in a variety of texts and make connections to real-life situations and other texts (ELA-1-M4)
8: GLE-46	Locate information found in graphic organizers such as timelines, charts, graphs, schedules, tables, diagrams, and maps (ELA-5-M6)

Watershed Drainage and Sources of Pollution

Learning Objectives

The learner will…

- make a model watershed using simple inexpensive materials.
- use the model watershed to investigate runoff, point source, and nonpoint source pollution.

Louisiana Grade Level Expectations (Social Studies)

5: GLE-16	Identify the natural resources used by people in the US (G-1D-M3)
7: GLE-66	Identify major technological developments related to land, water, and transportation and explain how they transformed the economy, created international markets, and affected the environment (H-1B-M10)
8: GLE-14	Analyze, evaluate, and predict consequences of environmental modifications on Louisiana landforms, natural resources, and plant or animal life (G-1D-M1)

Understanding Nutrients: Nitrates

Learning Objective **Completed**

Swamp Sweep

Learning Objective(s)

The learner will

- discuss adverse effects of debris on the wetland ecosystem
- identify common sources of debris in our wetlands
- collect, organize, and analyze data determining amounts and types of debris
- use the results of the data to identify possible solutions or action towards public awareness
- understand that students can make a positive contribution to our community and make a difference in the world

Louisiana Grade Level Expectations (Social Studies)

7 GLE-4	Explain ways in which goals, cultures, interests, inventions, and technological advances have affected perceptions and uses of places or regions in the US (G-1B-M4)
7: GLE-66	Identify major technological developments related to land, water, and transportation and explain how they transformed the economy, created international markets, and affected the environment (H-1B-M10)

A Song on the Bayou

Learning Objectives

The learner will…

- compare the body parts of a nutria and an alligator.
- describe how the skin, fur and feet of the nutria and alligator are related to their function and to the survival of these animals in their habitats.

Louisiana Grade Level Expectations (Social Studies)

3: GLE-3	Interpret a graph, chart, and diagram (G-1A-E2)
4: GLE-63	Identify how dance, music, and arts of various cultures around the world reflect the history, daily life, and beliefs of the people (H-1D-E1)

Louisiana Grade Level Expectations (ELA)

3: GLE-43	Compare ideas and points of view from a wide variety of media, including TV, video, music, the Web, charts, and print materials (ELA-4-E6)
3: GLE-47	Determine appropriateness of collected information for a specified purpose (ELA-5-E2)
4: GLE-22	Identify an audience for a specific writing assignment and select appropriate vocabulary, details, and information to create a tone or set the mood and to affect or manipulate the intended audience (ELA-2-E2)
4: GLE-45	Paraphrase or summarize information from a variety of sources (ELA-5-E3)

Ask an Expert

Learning Objectives

The learner will…

- identify a family member or friend who is willing to be interviewed about the changes to the coast he or she has witnessed.
- conduct a survey with that individual to determine what changes to the landscape, the habitats and the fish and wildlife have taken place.
- develop a questionnaire covering key past, current and future land loss issues.
- record the interview on video or audio tape if equipment is available or make notes.
- prepare a presentation of survey findings.

Louisiana Grade Level Expectations (Social Studies)

4: GLE-18	Describe the importance of specific natural resources to human survival and human endeavors (G-1D-E4)
7: GLE-66	Identify major technological developments related to land, water, and transportation and explain how they transformed the economy, created international markets, and affected the environment (H-1B-M10)
8: GLE-14	Analyze, evaluate, and predict consequences of environmental modifications on Louisiana landforms, natural resources, and plant or animal life (G-1D-M1)
8: GLE-15	Analyze the benefits and challenges of the Louisiana physical environments on its inhabitants (G-1D-M2)

Louisiana Grade Level Expectations (ELA)

4: GLE-43	Evaluate the usefulness of information selected from multiple sources, including interviews (ELA-5-E2)
5: GLE-44	Locate, gather, and select information using data-gathering strategies, including: interviewing (ELA-5-M3)
7: GLE-42	Locate, gather, and select information using data-gathering strategies/tools, including: interviewing (ELA-5-M3)
8: GLE-42	Gather, and select information using data-gathering strategies/tools, including: interviewing (ELA-5-M3)

Weaving Our Wetland Economic Web

Learning Objectives

The learner will…

- list the economic activities of their community.
- conduct a survey of their families' economic activities.
- construct a Wetland Economic Web concept map for their community.

Louisiana Grade Level Expectations (ELA)

5: GLE-39	Deliver formal and informal presentations for a variety of purposes (ELA-4-M4)
5: GLE-48	Interpret information from a variety of grade-appropriate sources, including timelines, charts, schedules, tables, diagrams and maps (ELA-5-M6)
7: GLE-35	Deliver formal and informal presentations for a variety of purposes (ELA-4-M4)
7: GLE-46	Interpret information from a variety of graphic organizers including timelines, charts, schedules, tables, diagrams and maps (ELA-5-M6)

Wetland Promotions

Learning Objectives

The learner will…

- design a brochure advertising an imaginary swamp tour, charter fishing business, duck hunting guide service, hotel or guest house, or other tourist venue.
- investigate promotion and advertising in the tourism business.

Louisiana Grade Level Expectations (Social Studies)

5: GLE-16	Identify the natural resources used by people in the US (G-1D-M3)

Louisiana Grade Level Expectations (ELA)

5: GLE-8	Interpret ideas and information in a variety of texts and make connections to real-life situations and other texts (ELA-1-M4)
5: GLE-25	Write for various purposes (ELA-2-M-6)