Lafourche Parish:
FROM THE BEGINNING

Adapted From: Coastal Zone
Curriculum Resource Unit
Bulletin 1834

Louisiana State Department of Education
Barataria-Terrebonne National Estuary Program

Revision 2006 Writer:
Cally Chauvin

Lafourche Parish: From the Beginning

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Foreword

The continued demise of Lafourche Parish coastal wetlands will have many far-reaching consequences: some that can be tolerated, many that cannot. The basis for this document is to provide teachers with a "hands on" guide where material can be found on any one of a number of interrelated topics. The ultimate goal is to provide the student a more comprehensive understanding of the geology, history, socioeconomics, and biology of the Lafourche Parish wetlands. One cannot fully appreciate what is being lost until there is an understanding of what one has.

Through the use of the Internet, BTNEP provides teachers with access to several video clips to use as a curriculum resource. The following videos are used in conjunction with content oriented information: *America's Vanishing Wetlands, Vanishing Wetlands: Vanishing Future, Haunted Waters, Fragile Lands: Oh, What Tales To Tell!, and Rescuing The Treasure.*

Acknowledgements

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Objectives

The following are objectives for this curriculum. The curriculum is designed to:

- follow the GLEs and benchmarks set by the Louisiana State Department of Education
- reflect and communicate the interdisciplinary nature of the use of the coastal zone
- foster the development of skills needed to distinguish relevant from irrelevant information, to recognize bias in interpretations, and to judge the validity of data
- foster the development, understanding, and use of problem-solving models and skills
- promote an understanding of the complexity of coastal use problems and the trade-offs associated with alternative solutions
- help students develop skills in gathering, interpreting, and evaluating data
- help students recognize the interdependence of living things
- encourage the development of autonomy and competence in decision making
- recognize, encourage, and capitalize on the diversity of student backgrounds, interests, talents, experience, and abilities in classroom activities
- promote intellectual growth, changes in the affective domain, and participation in community activities

Content Principles

Nine coastal zones use principles underlieing the content of this curriculum. Those principles are:

1. The coastal zone is a finite natural resource that provides the main habitat for much of the living world, including humans.
2. The coastal zone is used for many different purposes. If any area is used for one purpose, its use for other purposes is limited.
3. Coastal zone use has a historical perspective.
4. Our need for coastal regions is increasing because of our growing population and its changing needs and wants.
5. Many social, political, economical, physical, and biological considerations are involved in coastal zone use decisions.
6. Each kind of coastal use has consequences, and many of those consequences cannot be reversed.
7. People have different attitudes and values about coastal zone use. Those differences may cause conflicts when an activity is proposed for a certain piece of land.
8. Coastal zone use planning is a dynamic process that involves trade-offs among concerned individuals. There is no perfect land-use plan for everyone.
9. Many laws and regulations concern coastal zone use. Ownership of land places the responsibility for its care on the owner.

What is Happening To Our Coast?

The Louisiana coastal zone is a geographic feature unique in the world. As Egypt was said to be a gift of the Nile River so is Louisiana a gift of the Mississippi River. The Mississippi drains forty-one per cent of the continental United States and part of Canada (Figure 1.). Soil carried by the river has been deposited in Louisiana for the last 6000 years to form what we now know as coastal Louisiana (See **BTNEP Video Clip Three**). All natural features in coastal Louisiana relate in some fashion to materials and processes associated with the emptying of the Mississippi River into the Gulf of Mexico. The Gulf of Mexico is the second major force making the Louisiana Coastal Zone what it is today. The interactions of these two water systems have made Louisiana an important center of domestic and world trade.

Winds, tides, and currents shape the land, deposit or rework sediments, subsidence occurs, and influence the climate of the coast. Storms originating in the Gulf cause harm to man and the land. Gulf resources, such as fish, furs, and petroleum, support great numbers of people in Louisiana and the rest of the country. Less than careful practices in harvesting these resources have helped the coastline to deteriorate. Since, we are losing the delta to the continental shelf; Louisiana is unable to replenish the necessary sediment to rebuild the land it needs.

Each component of the coastal zone contributes to the quality and character of the environment. The natural levee ridge areas, with their relatively higher elevations and firm, solid ground, provide the land areas along which settlement and agriculture can occur with minimum environmental modification. They are a solid base from which humans are able to utilize the resources of the coastal zone. They also provide habitats for thousands of migratory birds in the spring and fall. The distributary channels provide water access and, historically, have been major routes of transportation. The nearby swamp and marsh basins provide some protection to the ridge areas from coastal storms.

The estuary is the zone where saline and fresh waters meet. These estuarine areas are principal breeding and nursery grounds for many important fish and shellfish (**See BTNEP Video Clip One, BTNEP** publication: **Healthy Estuary (Environmental Indicators, 2002).** The estuaries also supply nutrients for an extensive food web and they have the ability to absorb natural wastes and supply nutrients for an extensive food web (See Activity One). Like the rest of the delta

zone, the marshes depend upon continuous land building and a balance of fresh and salt water. Changes in elevation or salinity drastically alter the vegetation and wildlife of an area.

The outermost zone of concern is the shoreline itself. Barrier islands, cheniers, and oyster reefs are extremely important aspects of the coastal area. These features buffer inland areas from eroding tides, winds, and dangerous storms. They limit the amounts of saltwater entering the estuary. Thus helping to create a brackish environment. They, also, protect humans and estuarine wildlife alike. Barrier islands are built up by the deposition of sand and delta sediment by Gulf currents. The currents move the sediment along the coast, forming long chains of islands. If this process is impaired, the barrier simply erodes away; the coastline is left vulnerable, and is likely to deteriorate.

We know that Coastal deterioration is a natural phenomenon. The mighty Mississippi River has been changing its course for millions of years to build new deltas and land formations. Since the Mississippi River was harnessed, it is unable to complete its natural course, so plans must be made to help correct the problems occurring. Efforts are now being made to reintroduce the Mississippi River into Bayou Lafourche. This Coastal Restoration Plan is one of many trying to focus on saving our coast. Lafourche and Terrebonne Parishes in particular are experiencing increasing rates of wetland loss. Many of the restoration plans are taking affect in these two parishes.

Another problem occurring is the Hypoxia Zone or "Dead Zone." The map (see figure 1) shows the Mississippi River Watershed. As you can see 31 states and two Canadian Providences drain into Louisiana. Due to fertilizers and other contaminants other states and areas are polluting our water area. Dr. Nancy Rabalais, Executive Director of LUMCON (Louisiana University Marine Consortium), is the renowned expert on hypoxia.

Hypoxia is an oxygen-depleted area caused by excessive nitrogen and phosphorus in the freshwater supply to the ocean. It causes immobility in fish and may cause many of them to die. Increased plankton growth decomposing on the ocean floor creates the hypoxic zone. This is one of the reasons why the wetlands are so important to Louisiana. They act as a filter system. The activity on creating a Wetscape will help your students to see how effective the wetlands can be at filtering out pollutants.

Figure 1. Mississippi River Basin Watershed.
www.epa.gov/msbasin/index.htm

Creating a Wetscape

Focus/Overview

This lesson introduces students to the watershed. Students make their own watershed to see how their water systems can be affected by what others do.

Learning Objective(s)

The learner will:

- Locate and label the Mississippi River Watershed in conjunction to Louisiana
- Build a watershed
- Distinguish between nonpoint and point pollution and give examples
- Research their immediate watershed location

Louisiana Grade Level Expectations

5: GLE-50 7: GLE-39	▪ Describe and analyze the consequences of several types of human activities on local ecosystems [e.g., polluting streams] (SE-M-A4).
5: GLE-49	▪ Identify and give examples of pollutants found in water, air, and soil (SE-M-A3).
5: GLE-4 8: GLE-2	• Locate major landforms and geographic features, places, and bodies of water/waterways on a map of the United States (G-1A-M1, G-1A-M2).
6: GLE-47	• Illustrate how various technologies influence resource uses in an ecosystem [e.g., forestry management, soil conservation, and nontoxic fertilizers] (SE-M-A8).
7: GLE-1	• Analyze various types of maps, charts, graphs, and diagrams related to U.S. history (G-1A-M2).
8: GLE-50	• Illustrate possible point and nonpoint source contributions and natural or human-induced pathways of a pollutant in an ecosystem (SE-M-A3).

Materials List

Teacher:

- Large baking pan aligned with clay in middle. Make a river with bends and curves (allow water to travel downward).

BTNEP Connection
Water Quality and Habitat

Grade Level
5-8

Duration
90 minutes or two class periods of 45 minutes

Subject Area
Science and History

Extension Areas

- Research the Dead Zone (Hypoxia) in the Gulf of Mexico
- BTNEP provides markers and supplies to label all storm drains around your school. (nonpoint)

Vocabulary

- Watershed
- Nonpoint Source Pollution (NSP)
- Point Source Pollution (PSP)

Original Source :

- Wetscape activity was adapted from: POW! Powers of the Wetlands book
- My Watershed activity sheet adapted from: www.watershed.org\
- Cally Chauvin

- Medicine bottles labeled and filled with the following:
    a. Fertilizer (yellow unsweetened Kool Aid powder)
    b. Herbicides (green unsweetened Kool Aid powder)
    c. factory output (red unsweetened Kool Aid powder)
    d. pollution (litter-small whole punched bits of paper)
    e. oil (soy sauce)
    f. animal waste (brown – bits of dried chocolate drink)
- Spray bottle with water (rain)

Student or groups:

- Cubes of clay, natural earth colors (brown, green, blue)
- Small plastic container (individual) or plastic paint roller pans (group)
- Use materials gathered from outside and/or other objects found or created in the classroom
- Bag of square sponges
- Plastic animals

Background Information

The Mississippi River drains 31 states and two Canadian providences. A raindrop falling in Lake Itasca, Minnesota would arrive at the Gulf of Mexico in about 90 days. (www.nps.gov/miss/features/factoids/index.html)

A watershed is a basin-like landform defined by highpoints and ridgelines that descend into lower elevations and stream valleys. A watershed carries water "shed" from the land after rain falls and snow melts. (www.watershedatlas.org/fs_indexwater.html) To determine which watershed you live in visit the EPA's Surf Your Watershed web site at www.epa.gov/surf/. There is a great mini movie about the Karst watershed at www.watershed.org/earth/karst.html.

Nonpoint source pollution (NSP) cannot be connected to one specific source. (run off, vehicles, boats, storm water, construction sites, agricultural sites, litter, etc…) Point source pollution can be identified. www.epa.gov/owow/nps/kids/index.html (Kid's page) http://ohioline.osu.edu/aex-fact/0465.html (table of nonpoint source pollutants and major sources)

Advance Preparation

1. Collect the materials.
2. Decide whether each student will make a Wetscape or divide students into cooperative groups.
3. Take a large cake pan aligned with clay down the middle to create a river. Have a pitcher with water & blue food coloring.

Procedure

1. Pour a small amount of blue water (river) into the indention of clay. Slant the pan as you fill the bottom of the pan. Ask students what will happen if you place a small amount of water into the river. They should tell you that it would travel to the end of the river. What happens if that drop of water is polluted? How can this affect the people living along the river?
2. Have all of the material available for each group of students. Tell them to create a model on a slope. They must build up one side of the container so that there is a slight indentation.
3. They must have at least one of the following in their model:
    a. a river or stream going down the slope
    b. a farming area
    c. a manufacturing company
    d. wetlands (sponges) at the end of their river or stream
    e. use any other materials available or create their own
4. Have different colored unsweetened Kool Aid powders in small medicine containers. Label one fertilizer, herbicides, factory output, pollution (litter), oil (soy sauce).
5. Have each group bring up their model so everyone can stand around it. Assign students from the group and students from the class to hold the medicine containers. One student at a time will place a little of content of each container where it would belong.
6. The teacher will spray the water bottle (representing rain) onto all of the area.
7. Continue until all of the Wetscapes have been rained on.

Blackline Master(s)

1. Map of United States
2. Map of your watershed
3. My Watershed Address

Assessment

- Write a brief summary of what they saw happen to their Wetscapes
- Identify and give examples of pollutants found in water, air, and soil
- Illustrate possible point and nonpoint source contributions and natural or human-induced pathways of a pollutant in an ecosystem
- Outline and label the states that form the Mississippi River Watershed
- Research their immediate watershed and compare it to the Karst watershed www.watershed.org/earth/karst.htm.

Resourcs/Websites

www.nps.gov/miss/features/factoids/index.html Mississippi National River and Recreational Center. 4/12/04.

Resources/Websites continued

http://watershedatlas.org/fs_indexwater.html
www.epa.gov/surf/
www.watershed.org/earth/karst.htm.
See www.iucn.org/themes/wani/eatlas/html/na12.html Water Resources eAtlas: Watersheds of North and Central America NA09 Mississippi
www.epa.gov/owow/nps/kids/index.html
http://ohioline.osu.edu/aex-fact/0465.html
www.watersheds.org/kids/printshed.htm
www.theodora.com/maps

Tradebooks:

Duey, K. and Bale, K.A. Survival! Flood. Aladdin Library. 1998. This book depicts the Mississippi River flood of 1927. Reading level: Ages 8-12

Name _____ Date _____ Class _____

My Watershed Address

What is your watershed address?

Go to www.epa.gov/surf/ to research your watershed. Using the information you've gathered, write your own watershed address in the form.

Street Address	Watershed Address
Street/road	Stream/creek
Town/City	Local bayou
Parish	River
State	Gulf
Country	Ocean

Watersheds Knowledge Section

Using the information at the website, answer the following questions:

1. In your own words, what is a watershed?
2. Where does the water from your local watershed finally end up?
3. What are some possible sources of watershed pollution in your community?
4. What would happen if everyone decided to start putting paved areas around their yards?
5. What can be done to reduce our impact on watersheds and their environment?
6. If you were designing a poster, what would you include on the poster to make the upper regions of the Mississippi River realize that what they do affects Louisiana? Create a poster on the back of this sheet.

Coastal Morphology

Coastal Louisiana consists of over five million acres of swamps, marsh, cheniers, natural levee forests, open bays and other water bodies, barrier islands and other habitats. These habitats are invaluable to the State of Louisiana because they have recreational and aesthetic values; they create an abundance of marine nursery areas and wildlife habitats, and serve as a nutrient source, as buffers from storms, as a natural filter for biodegradable wastes, as well as many other important functions. The coastal zone provides a wealth of renewable and non-renewable resources.

Presently, coastal Louisiana is experiencing increasing amounts of wetland loss, wetland alteration, and water quality degradation. Most of these are naturally occurring processes, such as subsidence, saltwater intrusion, sea level rise, hurricanes and other storms, waterfowl, and furbearer eat-outs, and wind and wave erosion. The activities of humans, however, have resulted in an increase in the rates at which these phenomena occur. Relative sea level rise in Louisiana has been estimated to be six times the average rate of other coastal areas, due to the amount of subsidence being experienced (See **BTNEP Video Clip**). Saltwater intrusion, if gradual, creates changes in marsh types and may kill salt-sensitive vegetation. Louisiana is currently losing coastal areas at a rate of 25-35 square miles per year according to Coast 2050. (See www.btnep.org BT Basins Habitat Change map).

The coastal zone comprises a band across the southern border of the state and ranges in width from approximately 30 miles at the west edge of the state to over 150 miles at the eastern and Mississippi River Delta areas of the state. It contains over 40 percent of the nation's coastal wetlands and 25 percent of all wetlands in the nation, making it one of the largest and richest estuarine areas in the world. Louisiana consistently ranks first in national fisheries tonnage which includes fisheries values from shrimp, crabs, oysters, menhaden, and other finfish. It has been estimated that almost two-thirds of all marine commercial fisheries species rely on coastal marshes and estuaries for part of their life cycle. In addition, the recreational sportsmen in the pursuit of fish and shellfish, waterfowl, game species and furbearers invest millions of working hours. All of these species spend all or part of their lives in the coastal marshes and wetlands of southern Louisiana. Thus the importance of preserving these areas cannot be emphasized enough. To understand the total land loss phenomenon we must look back at the history of the Mississippi River (See **BTNEP Video Clip**).

History of the Mississippi

For over 6000 years the Mississippi River has been delta-switching every 1000 years, causing some areas of land to build while other areas deteriorate. The river has created seven major delta complexes containing over sixteen separate lobes extending from southwest Louisiana to the eastern shoreline of Lake Pontchartrain (See **BTNEP Video Clip** -shows all seven deltas).
These delta lobes experience phases of aggradation and degradation. The former represents the growth phase, when fluvial input and sedimentation rates are at their maximum. When gradient conditions are favorable, diversions are triggered at some upstream points. This initiates the delta-switching process, abandoning a particular river channel and beginning a phase of degradation within the specific lobe. The introduction of sediments being abandoned slowly decreases as a result of fluvial discharges at another location. The river now changes its course, abandons the old delta lobe and builds a new one. The old lobe will begin to subside as no new sediment is being brought in to compensate for compaction of mud (subsidence).

The Lafourche delta lobe dates back about 2000 years, being built during the fifth shifting of the river. Because of sediment starvation many lobes are being washed away. Losses have been particularly heavy in Terrebonne and Lafourche Parishes. It has been projected by the year 2050 Louisiana will lose a majority of the Deltaic Plain and Chenier Plain (Go to **Animations:** Watch how the wetlands will disappear. Requires Flash).

An integral part of the degradation phase of the deltaic processes is rapid subsidence and coastal erosion. However human influences have affected the silting process more than nature. Levees have been heightened and reinforced to prevent floods. This prevents silts and clays from reaching the interdistributary marshes, thereby stopping the yearly buildup of sediment. Louisiana marsh mud contains up to 70% water by weight. Due to the desiccation of these clays by drainage, shrinkage and subsidence becomes a problem. Adding to this, the withdrawal of fluids such as groundwater and petroleum from the subsurface removes the support of reservoirs, resulting in collapse of these reservoirs and surface subsidence (see the Indicator 2002 Report).

The barrier islands, located from Grand Terre on the east through the Timbalier Islands to the Isles Dernieres on the west, were formed during the destructive phase of delta building and mark the seaward boundary of the old

Lafourche delta lobe. The overall role of the barriers is to cushion the impact of the sea upon marsh deposits. Barrier Islands and tidal inlets in the past have been important regulators both of water exchange between the bays and the gulf and of transfer of wave energy from the gulf to the bays. As barrier islands erode and tidal inlets widen, the impact of the sea upon the bay area and lower marshes increases. The Louisiana barrier shorelines are characterized by erosion and retreat of shoreline as well as high subsidence rates. In the past, retreat rates and erosion were offset by sediment input renewal. Repeated overtopping of the Mississippi River's natural levees in the spring provided sediments necessary to maintain wetlands. Tidal forces provided distribution of these sediments within the marshes.

During the spring floods many distributaries received valuable coarse sediments (sand) and deposited them along the shoreline. Bayou Lafourche was an important conduit for river sediment until the early 1900's, when a log jam was reinforced to totally block the river. Today, the Mississippi River is contained by levees throughout the deltaic plain. Sediments are now no longer being introduced into interdistributary swamps and marshes, but are moved to the steep slopes of the outer continental shelf by way of the passes of the presently active delta at the mouth of the Mississippi River. The exception to this process is the Atchafalaya Bay delta, which is receiving 30% of Mississippi River water flow and is also contributing to mudflat accretion on the Chenier Plain shoreline. The land *accretion* is not offsetting the massive deterioration of land elsewhere along the coastline. This deterioration is amounting to over 25-35 square miles per year of coastal land loss in the deltaic plain.

Two major features of the deltaic plain are natural levees and interdistributary marshes. Natural levees border both ancient and active distributary channels. These high ground levees are a few feet above the surrounding sediments and contain sand and silt that is coarser than the surrounding sediments. Levees are formed during flood states when the river overflows, depositing the coarsest part of its load next to the channel.

Between the distributary channels and levees, the land is formed from the very fine silts and clays remaining in suspension after the coarser fractions have been deposited. As the river deposits these sediments, a considerable amount of water is trapped between the sediment particles. As time passes, and more sediment is deposited, the water is gradually squeezed out of the underlying sediment, resulting in a gradual settling of the land. The process of land settling by

squeezing water out is called *subsidence*. This low-lying land is subject to flooding, and forms marshes between the distributaries, which are called interdistributary marshes. Various semi aquatic plants, including several species of the familiar marsh grass, cordgrass or Spartina, colonize these marshes. Spartina grass, unlike many plants, can tolerate salt water, colonizing both salt water and brackish water marshes (See CD **Knee-Deep in Louisiana Wetlands**). The common salt water marsh grass *Spartina alterniflora* has special salt glands in the leaves that excrete excess salt, and during periods of low rainfall, salt crystals actually form on the grass blades. This ability permits *Spartina* to grow in vast monospecific stands where no other higher plants can grow, forming the vast expanses of salt marsh. *Spartina* cannot, however, grow under water, and is restricted to growing on land that is at least exposed (out of water) at low tide. If marsh grass is transplanted to areas that are flooded all the time is will die.

Freshwater marshes are colonized by a greater variety of semi aquatic plants, such as the common cattail *Typha*, in addition to grasses. Freshwater marsh plants can tolerate being constantly submerged. They have a salinity range of 0-2 ppt. Death will occur if exposed to high salinity areas.

Freshwater marshes are formed much further inland than salt marshes. Because of this, these marshes contain much less silt and clay sediment, and more organic matter from decaying vegetation. Salt marshes also contain organic matter from dead grass blades. Marsh grasses, like most grasses, die back each winter, and produce new shoots and blades each spring. Marshes can balance subsidence with accretion by trapping sediment and organic matter. If sediment input is curtailed, as it had been by high human levees along the Mississippi, then new sediment cannot reach the marshes and build them up. Subsidence continues to occur, and gradually the soft land that supports the marshes sinks below the low tide level and remains submerged all the time (**BTNEP Video Clip**). The dominant salt marsh and brackish marsh grass, Spartina, dies because of the continuous submergence, and eventually the marsh turns into shallow open water.

Another consequence of this sinking of vast stretches of former salt and brackish marshland is that salt water, like any water, "seeks its own level," in this case sea level, and flows farther and farther inland. This flow eventually reaches far enough inland to flood the freshwater marshes, killing the freshwater marsh plants that are not salt tolerant (eg. Cypress trees-low salt tolerant).

There are several ways in which human structures hasten the demise of the marshes. Canals, which cut through the protective salt and brackish marshes, can bring salt water directly into freshwater marshes and swamps, which then die because they are not salt tolerant. Dead-end canals in salt and brackish areas kill large areas of marsh (see BTNEP Video Clip). The spoil banks, the long piles of clay and silt made when the canals are dug, may reach heights of three to four feet above the marsh surface, and interfere with the normal flooding and draining of water that occurs with each tide. Water is trapped behind these long piles, which act like man-made levees, causing the marsh to remain submerged and waterlogged. This is a killing stress for the marsh grass *Spartina* that cannot tolerate constant submergence. Large areas die and become open water ponds behind the spoil banks of dead-end oil canals in salt and brackish marshes.

Locally, Lafourche and Terrebonne parishes are on the surface of the abandoned Lafourche subdelta that was active between approximately 1700 and 700 years ago (early and late Lafourche deltas). The Mississippi flowed down what is now Bayou Lafourche as far as Thibodaux where it broke up into several distributaries. During the active early Lafourche stage, the major distributaries flowed south along Bayous Terrebonne, Blue, and Little Black. They branched again in the vicinity of Houma forming a dense network of distributaries. A true delta-shaped landmass formed an arc that extended approximately one mile seaward of the Isles Dernieres. Lower Bayou Lafourche was nonexistent at this time. The early Lafourche distributaries were then abandoned, and this part of the subdelta began to undergo the destructional phase.

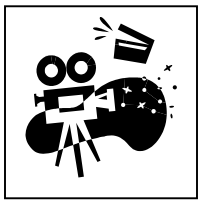
The subdelta then entered the late Lafourche stage when lower Bayou Lafourche became the chief distributary. This diversion was not a sudden event and may have taken up to 100 years to complete. The river broke into a series of distributaries first at Lockport then at Larose, forming small lobes to the east of the present bayou. Eventually, Bayou Moreau became the principal distributary and the delta progressed well beyond the destructional barrier shoreline of the early phase.

About 700 years ago, the Mississippi River abandoned the Lafourche delta. Subsidence and coastal erosion have removed surfaced expressions of the seaward portions of the distributaries allowing Timbalier and Terrebonne Bays to form. These bays have enlarged rapidly as marshland deteriorates. Bayou

Lafourche carried some Mississippi River water until 1906 when it was dammed off from the Mississippi at its head at Donaldsonville. As a result, the Lafourche delta has been deprived of fresh water. Rapid deterioration has occurred with distributary levees being reduced in height, width, and length and marshes have become ponds, lakes, and bays.

Saline waters and marshes migrated inland into brackish and freshwater environments. Old deltaic sediments are presently being reworked which now form the beaches at Fourchon and Grand Isle. Due to coastal erosion, subsidence, lack of new sediment, and other contributing factors, theses beaches are slowly disappearing.

Ask an elder in your family about the view from the Leeville Bridge then and now. See the activity, "When you were my age …"



Vanishing Wetlands, Vanishing Future

Focus/Overview

This film is presented by BTNEP & NSU. It provides the viewer with Detailed information on Louisiana Coastal Wetland. Students will enjoy the fun-paced action as they view what is happening to their coastal ecosystem.

Learning Objective(s)

The learner will:

- View the video, Vanishing Wetlands, Vanishing Future

Louisiana Grade Level Expectations

4-GLE-18	• Describe the importance of specific natural resources to human survival and human endeavors (G-1D-E4).
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)
8-GLE-17	• Identify a contemporary Louisiana geographic issue, and research possible solutions (G-1D-M4).

Materials List

- Video from BTNEP entitled, "Vanishing Wetlands, Vanishing Future."

Background Information

This humorous video on the BTNEP seven priority problems was produced by NSU. It is in the style of Bill Nye the Science Guy, and is best suited for Middle School, though the vocabulary is applicable to High School, and young kids love the action. The video is 60 minutes.

BTNEP Connection
Habitat, Barrier Island, Changes in Living Resources, Water Quality, Economic Development

Grade Level
4, 8

Duration
Film time: 60 minutes

Subject Area
Science, History, Geography

Extension Areas
- Write to La. Senators and Representatives about our problems

Vocabulary
- Estuary
- Hydrologic Modification
- Saltwater Intrusion
- Pathogen Contamination
- Toxic Substances

.

Original Source :
- BTNEP
- Cally Chauvin

Procedure:

1. Follow Video.

Tradebooks:

O'Leary, Marilyn Barret. OH NO! Hannah's Swamp is Changing. 2002.

Websites/References/Resources:

www.btnep.org

- ✓ BTNEP video, Vanishing Wetlands, Vanishing Future. 1996.
- ✓ BTNEP publication, **Healthy Estuary, Healthy Economy, Healthy Communities** … Environmental Indicators in the Barataria-Terrebonne Estuary System: 2002.
- ✓ New Orleans: The Natural History a film by Walter Williams

Biology

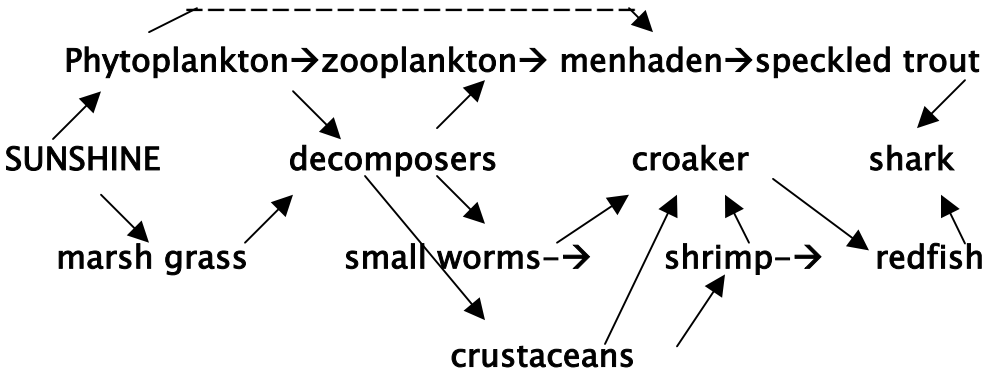
Coastal Louisiana is blessed with abundant wildlife and natural beauty, all very important to its citizens. In order to understand how important, one must first understand the relationships that exist among organisms and between these organisms and their physical environment; their ecology. The scientists that study these relationships, ecologists, are aware that all organisms need energy. Green plants, the producers, can easily meet their energy requirements by photosynthesis, the process that allows energy from the sun to be trapped to form food molecules. Animals, the consumers, must eat plants, or other animals that have eaten plants, to meet their energy requirements. Not only are the molecules of food consumed used for energy, but are also assimilated into the bodies of these organisms during growth (See Salt Marsh Habitat activity book).

To regain a real understanding of this system would require many years of study. With these materials and the student activities that follow, it is hoped that the students will gain a greater understanding of the problems that affect coastal Louisiana. With a better-informed voting public, it is hoped the solutions can be found that will save or help to save our wetlands.

Let's start at the beginning: A food chain is the transfer of energy in the form of biomass from producers to consumers. For example, marsh grass could provide energy for an insect, which could be eaten by a frog, which could be eaten by a snake.

Marsh grass--→ insect--→frog--→ snake

The transfer of biomass in real situations is more complicated. A complex transfer of biomass between populations of organisms is called a food web. Example:



The importance of decomposers cannot be overlooked. They are responsible for the rapid recycling of the nutrients locked into dead plant and animal matter. Seasonal changes in an ecosystem, such as a pond, a forest, or a marsh cause a large

accumulation of plant material such as leaf litter. In the marshes the plants most responsible for this litter belong to the genus *Spartina*. The two most common species of *Spartina* in coastal Louisiana are *Spartina alterniflora* (oyster grass), and *Spartina patens* (wire grass). Decomposition of this litter occurs, and the complex of energy-rich organic compounds and associated microorganisms that's left is called detritus. Detritus is considered to be one of the most important energy pathways in a food web. The detritus complex provides energy for many organisms that feed in or on the marsh and its estuaries. Flushing action of tides will transport detritus from the marsh surface into the adjacent water bodies, making it available to aquatic organisms (Figure 2.). Photosynthetic activity of *Spartina* and subsequent detritus formation contribute greatly to the productivity of our coastal area. Other processes, such as photosynthetic benthic algal and bacterial mats, also provide some energy.

Most people in Louisiana do not realize just how productive our coastal marsh estuarine system is compared to other systems. Productivity can be measured in several ways, but basically, it is the quantity of biomass (mass of plants and animals) in some unit of measure like kilograms/hectare or tons/acre that can be produced in a given area, during a designated time period, usually one year (Figure 3.).

The following table is a comparison of coastal marsh estuarine systems with other ecosystems.

BIOMASS: Dry weight in tons per acre per year.

DESERT	0.00 to 0.33
DRY AGRICULTURE	0.33 to 1.50
COASTAL MARSH ESTUARINE SYSTEM	**5.00 to 10.00**
MOIST AGRICULTURE (RICE)	1.50 to 5.50
COASTAL WATERS	1.00 to 1.50
OPEN OCEAN	0.00 to 0.33

Based on past and present scientific research, there are five major reasons why our coastal areas must be protected.

1. PRODUCTIVITY- Many organisms depend on the marshes as a rich energy source necessary for their survival.
2. SHORELINE PROTECTION- Coastal marshes and land serve as a hurricane buffer, wave barrier, and protection from flooding, etc.
3. POLLUTION FILTER TRAPS- Coastal Wetlands serve as an absorber of pollutants such as raw sewage and pesticides.

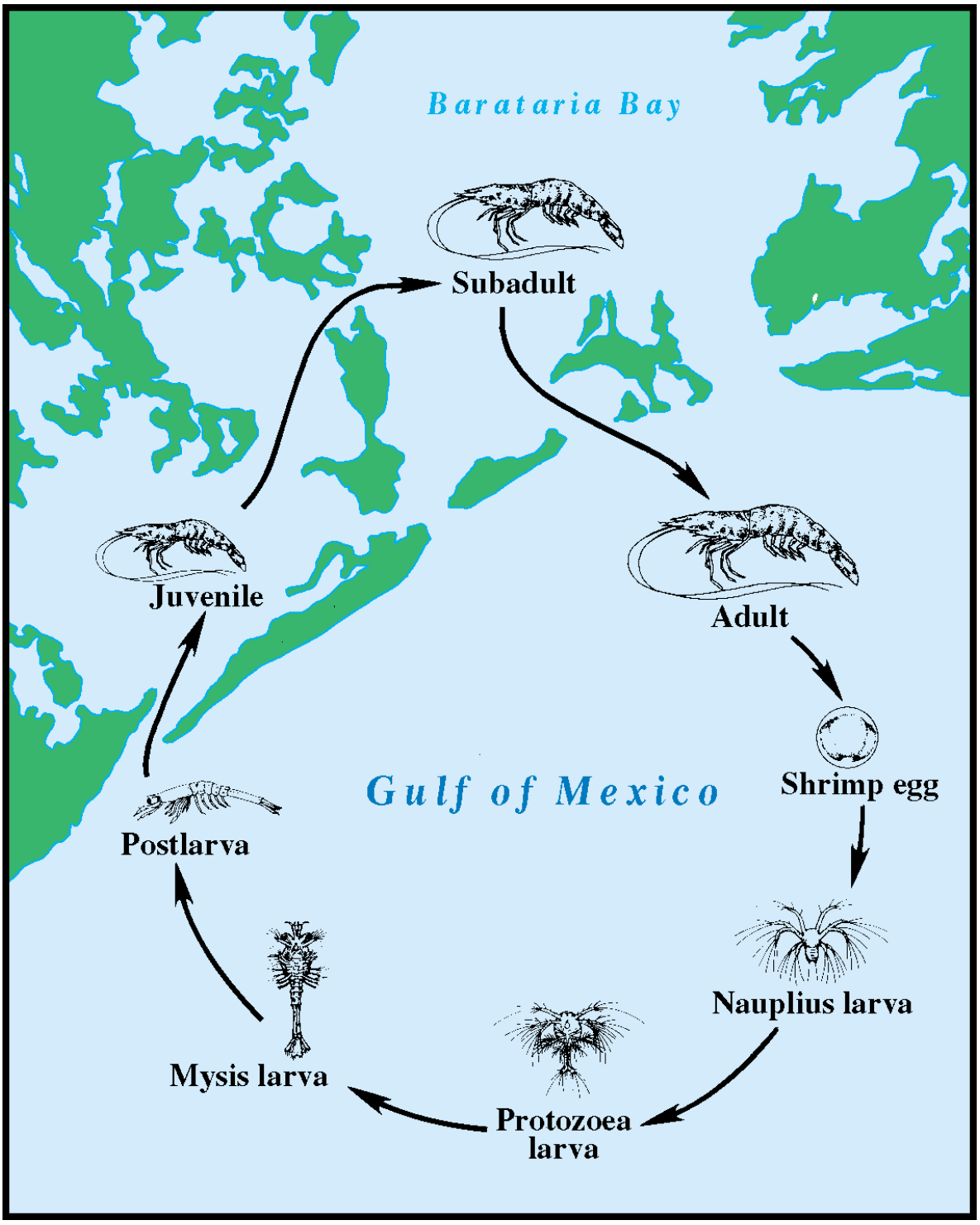
4. WILDLIFE HABITAT- Coastal wetlands serve as a major breeding ground and nursery area for many species. Estuaries are among the most biologically productive ecosystems on the planet. More than two thirds of the fish and shellfish we eat spend some part of their lives in estuaries.
5. ECONOMICS- The economic value of our coastal area can be measured in millions of dollars, involving industries such as seafood, fur, tourism, etc. Estuaries provide essential habitat for over 75 percent of our nation's commercial fish catch.

   All organisms that live in our coastal areas interact in some way, either directly or indirectly, with each other, creating a community of organisms (biotic community). Organisms also interact with their physical (abiotic) environment. Factors such as temperature, salinity, pollutants, etc. influence populations of organisms. Water quality is the most critical factor in the physical environment of coastal, estuarine areas.

By definition, an estuary is a coastal area where salt water from the ocean mixes with fresh water from rivers, rainfall, and upland runoff. Types of estuaries are defined as:

1. Coastal Plain- A drowned river valley; formed at the end of the last ice age; invades the low-lying coastal river valley and salt-water moves in to start a marsh. Example: Chesapeake Bay (MD), Narragansett Bay (RI)
2. Fjord- Formed by retreating glaciers that carved out coastal valleys. Example: Bay of Fundy in Nova Scotia, Trondheim Fjord, Norwegian Sea
3. Bar-Built- Sediments accumulate and build up sand bars and barrier islands. They are common near rivers. Example: Grand Isle, Barataria Basin
4. Tectonic- Created when the sea fills in a hole or basin that has formed by the sinking land. Example: San Francisco Bay area

Salinity (salt content) of estuaries is influenced by several factors. In Louisiana, salt water can be driven inland by tides, wind, and storm surges etc. causing salinity to rise sharply. Water from heavy rains driven by a strong north wind can move freshwater toward the coast, lowering salinity. This never-ending change in salinity creates a high variability in the environment, which organisms must cope with to survive. Many organisms have developed special adaptations for regulating salt content within their bodies.



picture by K. Varden

Figure 2. Shrimp Life Cycle

In addition to salinity, elevation (height above sea level) is also a factor in determining which kinds of communities can exist in a coastal area.

FIVE COASTAL ZONES BASED ON SALINITY AND ELEVATION

A. SALT MARSH	15 to 32 ppt (sea level)
B. BRACKISH MARSH	3 to 15 ppt
C. INTERMEDIATE MARSH	1 to 3 ppt (mid-elevation)
D. FRESHWATER MARSH	0 to 1 ppt
E. SWAMP	0 ppt (highest elevation)

Each zone has producers and consumers that can tolerate a certain salinity range. However some organisms can tolerate a greater salinity range than others and can exist in more than one zone. Any gradation based only on salinity has many exceptions. Organisms living in the middle zones where salinity varies the most, must be the most flexible of all (see **Estuary Live Video Clip**).

Organisms can be categorized according to where they live in the water column. The two principal categories for aquatic organisms are pelagic and benthic.

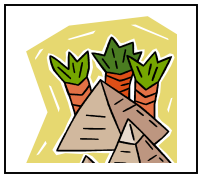
PELAGIC COMMUNITY- made up of organisms that live in the water column

A. Plankton- Small organisms that cannot swim strongly and thus are at the mercy of the water currents; floaters or drifters
   1. Phytoplankton- photosynthesizing, planktonic plants
      Example: Diatoms, dinoflagellates
   2. Zooplankton- non-photosynthesizing, planktonic animals
      Example: Acartia (a microscopic crustacean that can be up to 60% of the plankton) and larval (shrimp and crabs)

B. Nekton- Organisms that are active swimmers
   Examples: dolphins, sea turtles, sharks, rays, and bony fish, jellyfish, and squid

BENTHIC COMMUNITY- organisms that live on or in the bottom sediments or attached to some hard substrate such as a shell

A. Epifauna- live on the surface of the substrate
   Example: oysters, mussels, and barnacles, crabs, shrimp, and sea stars
B. Infauna- burrow in sediments; Example: worms, some amphipods, shrimp
C. Demersal- fish and other organisms closely associated with the bottom; Example: flounders, croakers, black drum.



Soft Drink Energy Pyramid

Focus/Overview

The purpose of this activity is to enlighten students as to the magnitude of energy loss that occurs between successive levels of an energy pyramid. *Bioconversion* is the conversion of wastes by biological means into energy and coproducts (This is a modified version of an activity taken from NSTA packet on bioconversion).

Learning Objective(s)

The objective(s) should describe what the students should Know or be able to do as a result of completing this activity
The learner will:

- Identify food chains and webs
- Discuss energy pyramid
- Identify producers, consumers, and decomposers

Louisiana Grade Level Expectations

2-GLE-46	• Illustrate and describe a simple food chain located within an ecosystem (SE-E-A2).
2-GLE-47	• Identify the Sun as the primary energy source in a food chain (SE-E-A2).
4-GLE-71	• Describe and explain food chains/webs and the directional flow of energy in various ecosystems (SE-E-A2).
4-GLE-72	• Predict and describe consequences of the removal of one component in a balanced ecosystem (SE-E-A2).
5-GLE-23	• Construct food chains that could be found in ponds, marshes, oceans, forest, or meadows (LS-M-C2).
5-GLE-24	• Describe the roles of producers, consumers, and decomposers in a food chain (LS-M-C2).
5-GLE-25	• Compare food chains and food webs (LS-M-C2).
5-GLE-28	• Explain and give examples of predator/prey relationships (LS-M-C4).
7-GLE-24	• Analyze food webs to determine energy transfer among organisms (LS-M-C2).
7-GLE-40	• Construct and draw food webs for various ecosystems (SE-M-A5).

BTNEP Connection
Habitat, Changes in Living Resources, Water Quality

Grade Level
2, 4, 5, 7

Duration
45 minutes

Subject Area
Science

Extension Areas

- Relate the pyramid demonstrated today to the energy problems of humans and possible solutions. Consider new energy sources and try to predict some technology of our future.

Vocabulary

- See background a-h

Original Source (if applicable)

- Adapted from NASA educational packet on bioconversion
- Cally Chauvin

Materials List

- 1- bottle containing 1,000 ml of soft drink
- 4- paper cups (approximately 120 ml each)
- 1- 100 ml graduated cylinder
- 1- 25 ml graduated cylinder
- 1- pipette 1 or 2 ml, graduated in 0.1 ml (a medicine dropper will do)

Background Information

Learning about the process of living things is essential to the conservation effort. The food chain and web is an intricate part of our life. The energy pyramid helps students to see the need of producers (BTNEP: Salt Marsh Habitat activity book).

The ultimate energy source is the sun. As food progresses through the pathways of a food chain, it leaves behind a significant percentage of its original energy. As a result, fewer members of a given species can be supported at each stage. Decomposers remove the last energy from the remains of organisms. Examples of food webs and a food pyramid can be found at the following web sites:

Encarta Food Web Food Chains and Webs

Here is a list of words and definitions that students should be familiar with: (Citing: Encarta® World English Dictionary [North American Edition] © & (P) 2004 Microsoft Corporation.)

a. CARNIVORE – **flesh-eating animal:** an animal that eats other animals.
b. CONSUMER – **organism that feeds on others:** in an ecological community or food chain, an organism that feeds on other organisms or on material derived from them. Consumers include herbivorous and carnivorous animals, which feed on plants and other animals respectively, and also organisms such as worms, fungi, and bacteria, which feed on nonliving organic material.
c. DETRITIVORE – **organism that feeds on detritus:** an organism that feeds on decaying animal or plant material. Detritivores such as bacteria, earthworms, and many insects aid in breaking down soil.
d. FOOD CHAIN – **feeding relationships among organisms:** a hierarchy of different living things, each of which feeds on the one below.
e. FOOD WEB – **food chains within ecological community:** the interlocking food chains within an ecological community.
f. HERBIVORE – **animal that only eats plants:** an animal that feeds only or mainly on grass and other plants.
g. OMNIVORE – **animal that eats anything:** an animal that will feed on any kind or many different kinds of food, including both plants and animals.
h. PRODUCER – ORGANISM **that makes its food:** an organism such as a green plant that manufactures its own food from simple inorganic substances. Producers are ultimately the sole source of food for all animals and other consumer organisms.

Advance Preparation

- Have the students assigned in groups of four
- Have all materials ready for use

Procedure

1. The teacher will pose the following questions: How do you think this liquid (soft drink) can help to represent some type of energy source? (energy drinks – Gatorade, 10K, PowerAde, V8) The teacher will explain that the 1,000 mL of soft drink represents 1,000 joules of energy from the Sun. (Energy is usually measured in calories and joules can be used to measure energy to work.)
   4.19 joules = 1 calorie 1,000 joules = 238.66 calories
2. Have each member choose one of the following roles (each member must be one of the roles):
   grass grasshopper snake hawk
3. Each member of the group is given a paper cup. Measure 100 ml of drink and pour it into cup of "grass person." Now pour the other 900 ml of drink down the drain! **(Teacher explains that 90 percent of the sun's energy is not fixed by photosynthesis as chemical energy (plant food), and therefore does not become part of the food chain.)**
4. Have "grass person" pour 10 ml of the drink (measured carefully with the small cylinder) into the cup of the "grasshopper person." "Grass person" may now consume 90 ml of the drink.
5. Have "grasshopper person" measure 1 ml of this drink (with the pipette) into the cup of the "snake person." "Grasshopper" may now drink the remainder of this portion.
6. "Hawk" may now drink the last drops (if it can be poured out of the cup).

Blackline Master(s)

These are worksheets that teachers can copy for student

1. Energy Pyramid Critical Thinking Sheet
2. Identify the Food Chains (Print out this assessment on **Food chains and Webs**).
3. "Food Pyramid of the Salt Marsh", from the BTNEP book, Salt Marsh Habitat.

Assessment

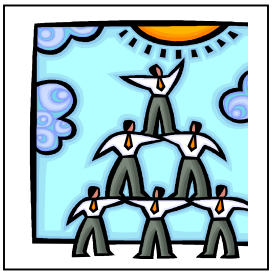
The students can complete the "Energy Pyramid" worksheet and the "Identify the Food Chain."

Resources

- "Marsh Mystery" found in the Wonders of the Wetlands book.
- Branbury, Mary. Lyons, Sue Ellen, etal. Wetland Blues. Food Chain & Web sections.

Tradebooks:

Cole, Joanna. The Magic School Bus Gets Eaten: A Book About Food Chains. 1996.
Somers, Rachel. Salt Marsh Habitat of the Barataria-Terrebonne Estuary.



Energy Pyramid Sheet

1. What part of the original energy received from the sun did each character receive?

2. How much more energy efficient would it have been if the hawk could just have eaten (consumed the drink passed on by) the grass?

3. Think about the activity you've just completed. Create a food chain, using the following aquatic animals: grasshopper, menhaden (minnow), speckled trout, and phytoplankton.

4. Add on to your food chain and create a food web. Make sure you have a human element. Label the producers, consumers, and decomposers.

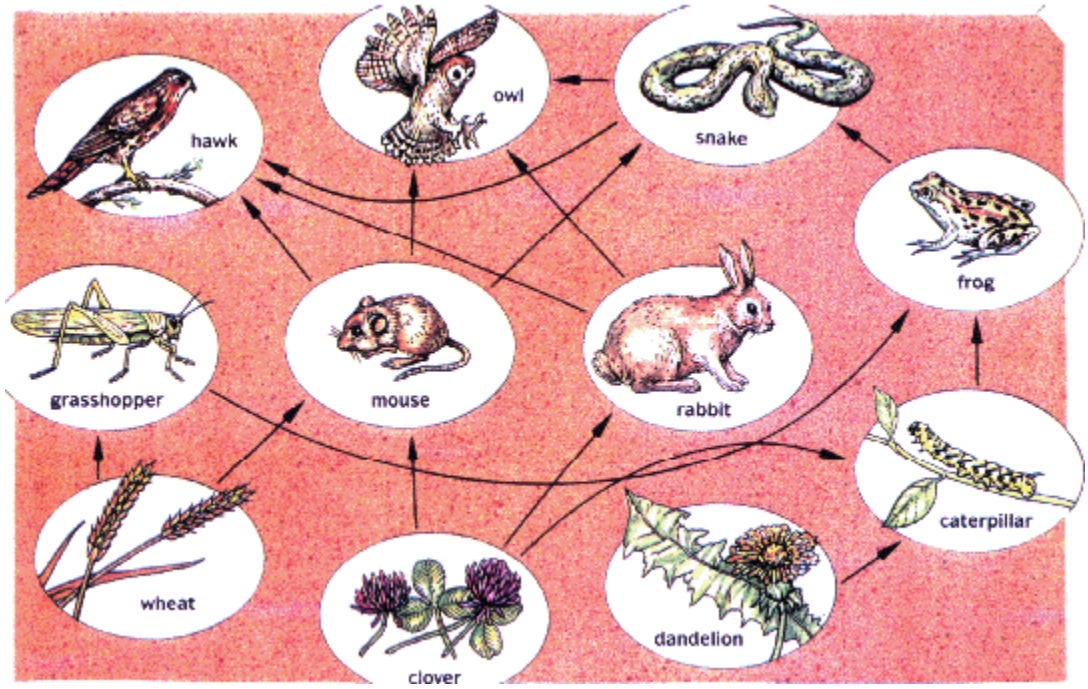
5. Follow one of the chains from start to finish. Explain how the energy is used.

Identify the Food Chains

Instructions:

Step 1: Print this page out.

A Food Web



Step 2: Use the picture above to answer the following question. Please write your answers in the space provided.

1. Identify the organism(s) that are producers?

2. Identify the organism(s) that are consumers?

3. List some of the food chains by writing the organism's name and drawing a line that points to the next organism in the food chain.

4. How many food chains can you find in the above food web?

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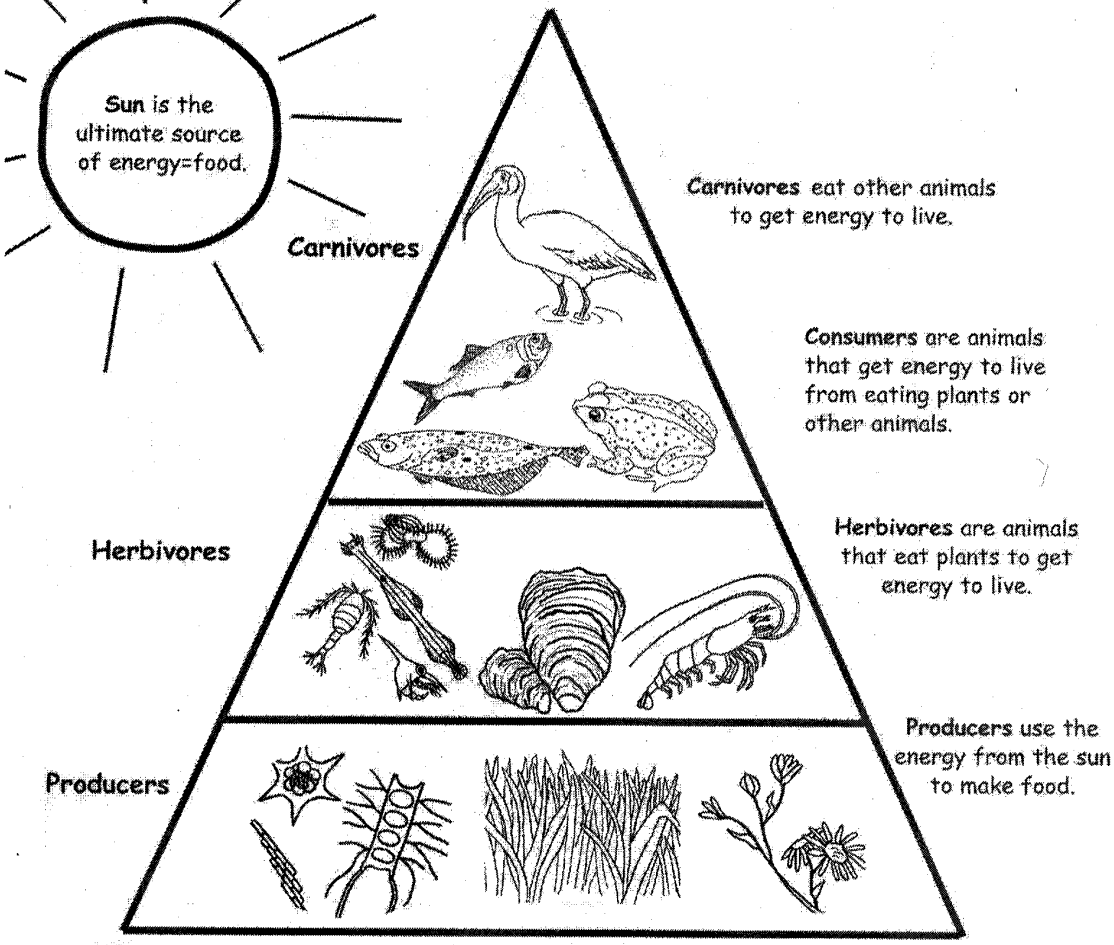
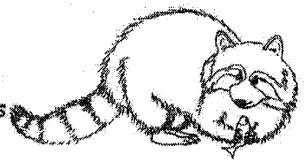
FOOD PYRAMID OF THE SALT MARSH



Omnivores are a type of animal that eat both plants and animals for energy to live. Some examples of omnivores are blue crabs, raccoons and humans.



From BTNEP: Salt Marsh Activity Booklet

Early Man in Louisiana

We generally think of Indians as living in the days of the Wild West, chasing buffalo across the prairie on an Indian pony. We seldom envision Louisiana as the home of the Indians, but long before the first European set foot on Louisiana soil, it was their home.

The ancestors of the first Indians arrived in North America approximately 30,000 years ago. Scientists theorize that these nomadic people crossed an ice bridge linking Asia and North America at the Bering Straits. Over thousands of years, descendants of these people spread throughout North America.

Scientists called archeologists provided the information on the pre-historic people to us. Archeologists carefully study sites of Indian villages to determine how these people lived (Figure 3.). In Louisiana these sites fall into one of three categories: 1) midden site – which is similar to a trash dump, 2) mounds – which were either ceremonial or burial, and 3) village sites.

The earliest Indian culture we have identified in Louisiana is the Paleo-culture. These people lived in Louisiana between 10,000 B. C. and 6,000 B.C. Their village sites have been found from the hill country of central Louisiana to the salt domes of Avery Island. Louisiana's environment and climate were much different at that time than they are today. Louisiana was feeling the effects of the Ice Age; sea level was lower, which meant the coast of Louisiana extended further into the Gulf of Mexico. Louisiana was part of the range of buffalo, mastodon, and mammoth.

Around 5,000 B.C. the early Indians of Louisiana underwent a cultural change. This group is identified as the Meso- or Archaic-Indian culture. These people were a more advanced culture than the Paleo-Indians. The Archaic-Indians fashioned tools such as knives, axes, and scrapers. They tamed and domesticated the dog, and although they were nomadic, they did not range as far as earlier groups. The Archaic Indians witnessed a drastic change in Louisiana's environment. The end of the Ice Age brought about a rise in temperature and in seal level. Large deltas formed along Louisiana's coastline, and made Louisiana a lush grassland with mild climates.

The best known of the pre-historic Indians belonged to the Neo-Indian culture. These people live in Louisiana form 2,000 B.C. to 1,600 A.D. The Poverty Point culture lived on the west bank of Bayou Macon in West Carroll Parish near Epps, Louisiana. The Poverty Point Indians were an advanced culture of about 5,000 people. This population made Poverty Point one of the largest population centers in

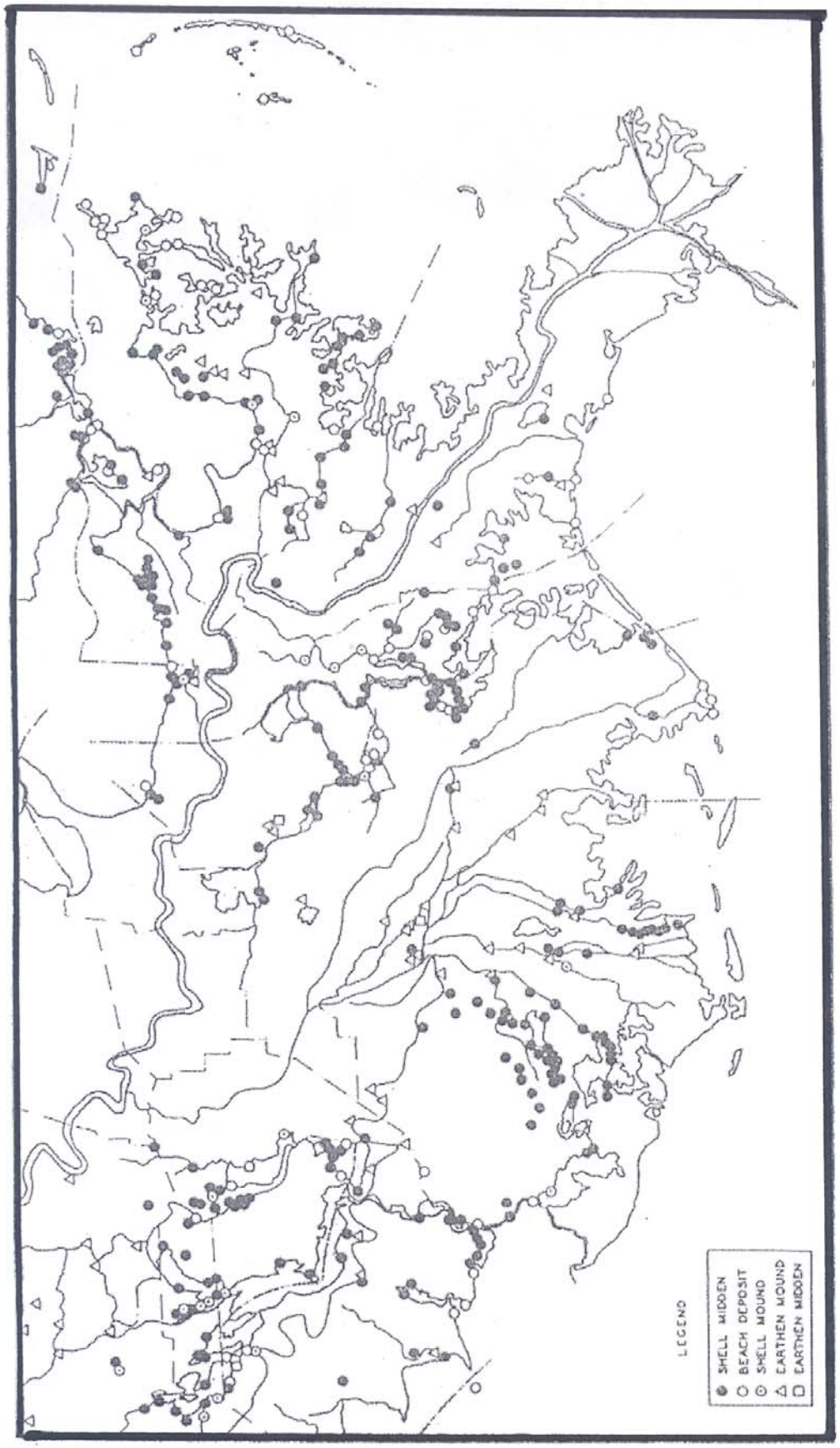


Figure 3. Map of Distribution Prehistoric Archaeological Sites in the Eastern Portion of the Mississippi River Deltaic Plain (from McIntire 1958)

North America at this time. The Poverty Point Indians built a total of 11.2 miles of ridges and terraces in geometrical designs. These ridges and terraces were used for ceremonial as well as practical purposes. Huts built on the terraces would be protected from the spring flood. (La. Cultural- to order books and Ed. resources).

At the time of the arrival of the first Europeans, Louisiana had a population of between 12,000 to 15,000 Indians. The major language group of South Central Louisiana was the Chitimacha (Indian meaning; "those having cooking vessels"). The Chitimacha Indians lived in the area from Bayou Teche to the Mississippi River. The Chitimacha Indians flattened the foreheads of their male children to enhance their appearance. Most of the men wore long hair, and there was an occasional mention of some warriors wearing *scalplock*, or a Mohawk. Males wore breechcloth and had extensive tattooing of the face, body, arms and legs. Women wore short skirts and their hair was worn long, usually braided. They were ranked into two groups, nobles and commoners. They believed in marrying someone from their own group. A noble man or woman who married a commoner forfeited their higher status.

Today the Chitimacha are the only Louisiana Indians living on their ancestral grounds. There are about 300 Chitimacha Indians living on a reservation near Charenton in St. Mary Parish.

The early Lafourche Indians adapted well to living in coastal Louisiana. They made their huts from palmetto leaves lashed to wooden frames. The Indians also built dugout canoes called "piragua" by the Spanish --- today we call them pirogues. The pirogues were built from cottonwood or cypress trees. The Indians would girdle a band of bark from the base of the tree. After the tree died, they would build a small fired at the base of the tree to fell the tree. Another fire was built to cut the log the length needed for the boat. Hot coals were placed on the log, and as the wood charred, the Indians would scrape away the ash to create a dugout.

Two tribes of Chitimacha Indians lived in what is now Lafourche Parish. Bayou Lafourche was commonly known as the "River of the Chitimachas." Before 1732, the Washa (Ouacha- means "hunting place") had several villages along Bayou Lafourche. The villages were located at Supreme in Assumption Parish, Thibodaux, Raceland, and at Lockport. Today, Washa villages are being excavated in back of Gheens on Golden Ranch Plantation. There is a Bayou Washa in Jefferson Parish, between Barataria and Cheniere Caminada according to the U.S. Census of 1880. The history of the Washa Indians shows that their relationship with the French was a violent one.

For more detailed information on the events that ensued between the French and Washa see www.biloxi-chitimacha.com/history.htm and www.dickshovel.com/chi.html.

The second tribe of the Chitimacha was called the Chawasha (Chouacha-means "raccoon place"). They lived near Lake Salavador and Larose. Armed black slaves destroyed their village in the 1730's. Gov. Perrier had instructed them to destroy the Indian village. After this time nothing else is mentioned about them.

Using the lush and isolated areas of Bayou Lafourche, the Washa and Chawasha tried to sustain their natural way of life. Both of these tribes made a living by hunting, fishing, and gathering. (Note: Bienville makes a reference to these two tribes upon his arrival and subsequent trips to Bayou Lafourche.)

Another major Indian group is the Houmas (meaning "red") Indians, who inhabited Terrebonne and the southern part of Lafourche Parish. Originally, east-central Mississippi was part of the Chakchiuma (meaning "red crawfish"). By 1682 the Houma had separated from the Chakchiuma and were living inland from the east bank of the Mississippi River just below the present border of Mississippi and Louisiana. The first encounter of the Houma Indians with Europeans was by LaSalle in 1682. In the year 1700, a bout with dysentery reduced their numbers substantially. They were attacked by the Tunica in 1708 and resettled just above New Orleans. In 1722, they were forced to move due to the pressure of white settlements. By 1730 epidemics introduced by the Europeans brought down the once numerous people to just four hundred strong.

Their homes were wattle and daub construction mound type dwellings, which were built into the hillsides. They were arranged in a circular pattern of two rows with a large public area in the middle. Their bodies were extensively tattooed including the face (www.sdsd.essortment.com/houmaindiansna_rmrv.htm).

During the next 50 years they gradually drifted south into Terrebonne and Lafourche Parishes southwest of New Orleans (www.dickshovel.com/hou.html). Today, the Houma Indians have petitioned for federal recognition and have over 11,000 members on their tribal role in Lafourche and Terrebonne Parishes. They have annual tribal festivals, which include their sacred art of dancing.

The Indians of the Lafourche region have contributed much to the history and culture of the area, from area names to food. The next time you think about Indians, you may want to envision a cypress swamp with a pirogue gliding through its waters.

Bayou Indians

Focus/Overview

This lesson focuses on the Indians of the Bayou. Students will research crafts, life styles, customs of the Indians and create an object that reflects a part of their heritage.

BTNEP Connection
Cultural Heritage

Grade Level
5, 8

Duration
Two 45-minute classes

Subject Area
History

Extension Areas
Extension area detailed in the activity/lesson.

Vocabulary
- Chitimacha
- Washa
- Houma

Original Source (if applicable)
- Cally Chauvin

Learning Objective(s)

The learner will:

- Research the customs of the Indians along the Bayou
- Create an object that represents one part of the Indian culture

Louisiana Grade Level Expectations

5:GLE-15	Explain and give examples of how Native Americans and Europeans adapted to living in a particular North American physical environment (G-1D-M2).
5:GLE-27	Identify and describe indigenous cultures and groups that existed in the Americas at the beginning of Europe exploration (H-1B-M1).
5:GLE-36	Identify instances of both cooperation and conflict between Indians and European settlers (H-1B-M3).
8:GLE-75	Describe the contributions of ethnic groups significant in Louisiana history (H-1D-M1).
8:GLE-69	Propose and defend potential solutions to past and current issues in Louisiana (H-1A-M5). HOUMA INDIAN RECOGNIZED

Materials List

- Markers
- Construction paper
- Colors
- Toilet paper and paper towel rolls
- Beads
- String and yarn
- Pieces of branches and leaves
- Modeling clay
- Sack cloth

Background Information
Read the section "Early Man in Louisiana."

Advance Preparation
- Print out pictures of Louisiana Indian homes

Teacher Instructions
1. Ask the students, "What types of images do you see when I say the word "Indian"?
2. Write down on the board or overhead, their responses.
3. Let the students know that Indians along Bayou Lafourche did not live in teepees as they might have assumed through the television programs. State that they will find out how they lived and some of their customs.
4. Hand out the "Indian Fact Sheet."
5. Have them complete the questions, essay question, and then create an object.

Blackline Master(s)
1. Bayou Indians
2. Fact Sheet

Assessment
1. Complete the Bayou Indians Activity. The questions can be used as a grade, also the object that they have to create.

Resources
- Lora Chanson, Houma Tribe. Lora is a dancer, works with the youth of her tribe and the International Council of Louisiana. She teachers and demonstrates contemporary beadwork and tribal dances. Contact her through the LA Wildlife and Fisheries Museum, Kenner, LA. (504) 468-7232.
- Janie Luster, Houma Tribe, Artist. Known for her garfish and redfish scale jewelry, Spanish moss dolls and palmetto baskets. She demonstrates basket weaving and teaches about the Houma tribe and artwork. Contact her through the LA Wildlife and Fisheries Museum, Kenner, LA. (504) 468-7232.

Websites/References:
www.biloxi-chitimacha.com/history.htm
www.dickshovel.com/chi.html
www.dickshovel.com/hou.html
www.eatel.net/~wahya/tribes.html
www.angelfire.com/realm/shades/nativeamericans/chitamacha.htm
www.hiddenhistory.com/PAGE3/swsts/louise-1.htm
www.kahless.com/houmas.htm
www.sdsd.essortment.com/houmaindiansna_rmrv.htm

Researching Bayou Indians

Houma
Chitimacha
Chawasha
Washa

I. Look at the list of Indians that lived along Bayou Lafourche.
2. Pick one group to research.
3. Complete the following questions by using the Fact Sheet:
   a. What is the name of your Indian Tribe?
   b. What does it mean?
   c. Why do you think the Houmas Indians would have their houses placed in a circular pattern?
   d. What do you think the tattooing of the Indian bodies signified?
   e. Look at one important fact and explain how this fact affected history.
4. Create a drawing or clay setting using the chart to demonstrate the Indian Tribal cultural.
5. Essay question: Do you think the Houma Indians should be recognized by the Federal Government? Why or why not? Should they be able to sue the Federal government? Why or Why not? (Research why they are having problems with the Federal government.)
6. Create an object that represents your Indian tribe. Write a paragraph explaining your object and how it relates to your tribe. Use as many facts as you can to make your object.

Bayou Indian Fact Sheet

Tribes	Chawasha	Chitimacha	Houma	Washa
Meaning	raccoon place	men altogether red	red	hunting place
Homes	made out of mud (used material of the land) or palmetto leaves, roofs were thatched	made out of mud (used material of the land) or palmetto leaves, roofs were thatched	Wattle and daub houses, arranged in a circular pattern	made out of mud (used material of the land) or palmetto leaves, roofs were thatched
Clothing	• Breechcloth for males • Short skirts for women	• Breechcloth for males • Short skirts for women	• Breechcloth to the knee • Short skirts for women	• Breechcloth for males • Short skirts for women
Customs	▪ Flattened foreheads of male children ▪ Extensive tattooing on the body and face	• Flattened foreheads of male children • Extensive tattooing of face & body • Built animal shaped and platform mounds)	• Extensive tattooing on the body and face	▪ Extensive tattooing on body and face ▪ Flattened foreheads of male children
Weapons/ Tools	spear thrower, sharp heads of fish-bone,	Blowguns, cane darts, fishbones and garfish scales	Grew corn, beans, squash, & melons (Mostly lived off the land for food)	spear thrower, sharp heads of fish-bone
Hair	• Women wore long and braided • Most men wore long hair	• Women wore long and braided • Most men wore long hair	• Men and Women wore long & braided	• Women wore long braided • Most men wore long hair
Creative Skills	▪ Basket weavers ▪ dancers	▪ Basket weavers ▪ Dancers ▪ Jewelry makers	• Ritual ball game • dance	• Basket weavers • dancers
Important Fact	In 1730's, their village was destroyed. No further mention is found of them after this time.	Oldest tribe in Louisiana, Their reservation is found in Charenton, Louisiana	State recognized but not Federally recognized tribe, Suing Fed. Gov't	Had a village in back of Gheens, Last record in 1805, 2 men & 3 women scattered in French families.

European Man in Louisiana

When we look at Louisiana today we see a modern, industrial state. We enjoy the comforts and luxuries of a modern society. This was not always the case. Our modern state had to be formed from a rugged wilderness. The early explorers and colonists endured many hardships in order to remain in what is present day Louisiana.

All too often a society has the tendency to simplify its history: this person explored this, that person settled there. It was not until the Challenger tragedy that we realized the price many of the earlier explorers and colonists paid so that we may be here today.

The early explorers sought the riches that gold and silver would bring. The Spanish had found great wealth in Mexico and continued to explore the area in hopes of finding more. Early Spanish explorers had explored the Gulf Coast as early as 1519. On May 8, 1541, after exploring much of the southeast United States, Hernando De Soto discovered the Mississippi along the Louisiana-Arkansas border (Figure 4.). De Soto and his men did not appreciate the significance of their find.

France had centered its exploration of the new world in the area of Canada. The French couriers de bois, or fur trappers and traders, found that the fur trade was as profitable as gold mining. Through their dealings with the Indians of the Ohio Valley they had heard of the "Great Water", or the Mississippi River. The first Frenchman to explore the river was Father Marquette, a Jesuit priest, and Louis Joliet, a courier de bois. They explored the Mississippi as far south as the mouth of the Arkansas River. Because they feared the Spanish along the coastline, Marquette and Joliet returned to Canada. The first Frenchman to explore the Mississippi to its mouth was Rene Robert Cavelier, Sieur de La Salle. LaSalle's expedition reached the mouth of the Mississippi River on April 9, 1682 (Figure 5.).

LaSalle failed on his return voyage as he attempted to find the mouth of the Mississippi through the Gulf of Mexico. It should be noted that LaSalle did not have the benefit of a GPS, modern maps, or navigational equipment and that the mouth of the river was not as clearly defined as it is today.

Following LaSalle's failure, Count de Pontchartrain, the French Minister of Marine, sent the Le Moyne brothers (Pierre Le Moyne, Sieur d'Iberville, and Jean Baptiste Le Moyne, Sieur De Bienville) to explore and colonize the Louisiana territory. Iberville planned his expedition well. In September of 1698, he sailed from LaRochelle,

Figure 4. Routes of Hernando De Soto

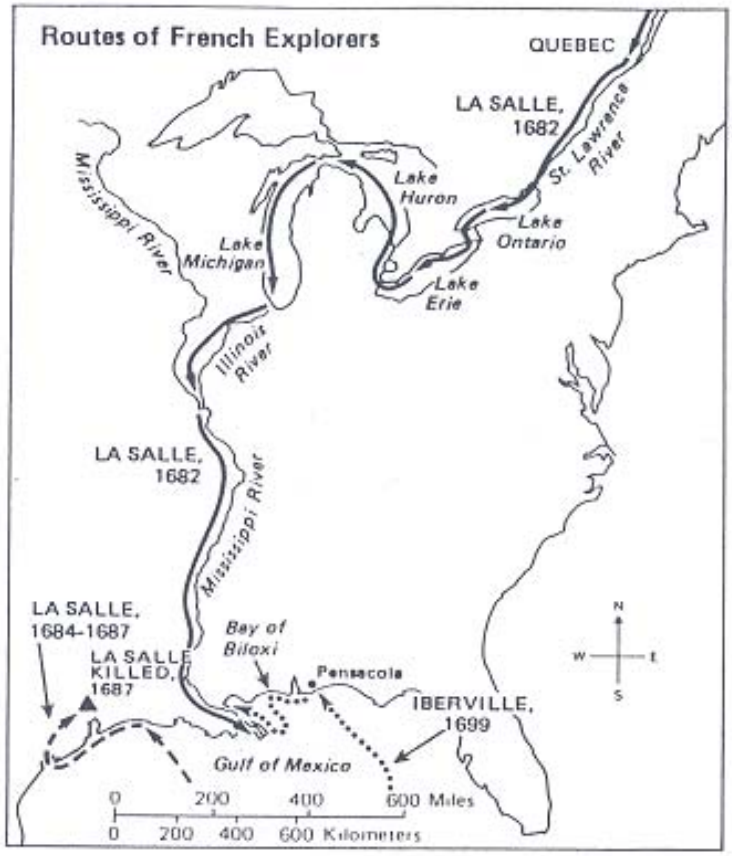


Figure 5. Routes of La Salle and Iberville.

France; on January 26, 1699 he arrived at Pensacola Bay, Florida. Iberville's strategy was to explore the Gulf Coast from small boats to find the mouth of the Mississippi. On March 2, 1699 Iberville discovered a strong flow of fresh water. As he explored up river and made contract with the Indians, he knew he had found the Mississippi River.

Iberville's early explorations of the region put him in contact with the Houmas Indians. These tribes used a red pole to mark the boundary of their village—the French referred to the area as Baton Rouge. Iberville returned to the base camp at Ship Island through the Amite River. Along the way he passed through and named Lake Maurepas for the son of Pontchartrain, and Lake Pontchartrain for the French Minister of Marine. Bienville traced the original route back down the river. Bienville encountered the Chitimacha Indians living on a fork of the Mississippi River. The area was later named La Fourche De Chitimacha; this was Bayou Lafourche.

Iberville's early maps of the Louisiana territory label the area from the Atchafalaya to Lake Pontchartrain as "Trembling Prairie". Today we refer to the floating marsh as "flotant". The distance from the Gulf of Mexico to a suitable site to build a colony in Louisiana caused Iberville to look to the Mississippi Gulf Coast where he built Fort Maurepas on Biloxi Bay.

The first attempt to build any type of settlement in Louisiana came in 1700 with Fort de La Boulaye about 50 miles from the mouth of the Mississippi in what is now Plaquemines Parish. The fort was inhabited for only a few years and then abandoned.

The first permanent French settlement in Louisiana came as a result of the efforts of St. Denis to establish trade with the TeJas Indians in Spanish Texas. St. Denis traveled up the Red River to the site of the Natchitoches Indian village along the Red River, where he built Fort St. Jean Baptiste de Natchitoches in 1714. In 1718 Bienville convinced the company of the Indies to build a city on the crescent in the river. The chief engineer Le Bland De La Tour objected to the site selection because it was below sea level and apt to flooding. Bienville named his city Nouvelle Orleans, or New Orleans. The city was nothing more than crude huts that were blown away several times by storms. Flooding was a regular event and the royal engineers finally recommended another site for the city. Bienville persisted, and Adrien de Pouger, the royal engineer, laid out the plans for a city. In 1721, about 470 people lived in what is now New Orleans. Bienville's site selection placed Louisiana's largest city at the state's lowest point of elevation—five feet below sea level.

In the early 1720's, German families settled upriver from New Orleans in an area that became known as the German Coast (i.e. St. Charles Parish and St. James Parish). Their farms helped feed the people of New Orleans. In the 1760's they were joined by the Acadians who had been exiled from Nova Scotia. Over several generations, Acadians, Germans, French and Spanish Creoles and other groups came together to produce Cajun culture. From the Mississippi River and the St. Landry and St. Martin areas, these Cajuns migrated southward along the bayous to the Gulf of Mexico.

Investigating European Man in La.

Complete the worksheet on the reading selection.

1. What were the early explorers looking for? Why?

2. What was the "Great Water" the Indians talked about? Why would this be important to the explorers?

3. Using the following explorers create a time line placing them in order from earliest explores to most recent year:
   Desoto LaSalle Le Moyne brothers
   Marquette and Joliet St. Denis

4. Who set up the first permanent settlement and why?

5. Why did the chief engineer Le Bland De La Tour object to Bienville establishing the settlement of New Orleans?

Louisiana Crops & Fur Resources

As in the case of colonies, the prime objective was to develop industry to help the colony to prosper. The early Louisiana colonists were farmers and fishermen, merchants and traders. Two unusual crops grown in the early Louisiana colony were indigo and wax myrtle trees. The French had experimented with the bayberry or wax myrtle tree, and humans have used the wax myrtle from Mexico to Pennsylvania. In 1721, Father Charlevoix recommended the development of an industry for the wax-bearing plants in Louisiana. By removing berries from the tree and placing them in a cloth sack, then placing the sack in a vat of water over a low fire, the wax separated from the berry. The water was heated to about 109 degrees F, causing the wax to form a film on the surface of the water, which was removed and allowed to cool. The greenish-yellow wax was formed into candles. Bienville encouraged the development of the wax industry. Michael de La Rouvilliere wrote of one of the settlers, Sieur De Dubreuil, who manufactured 6,000 pounds of wax. Planters began to develop wax myrtle plantations, with some plantations having as many as 2,000 wax myrtle trees. New Orleans became the center of the wax trade in North America.

When the first Europeans arrived in Louisiana they found a land rich in natural resources. The early colonists were quick to make use of Louisiana's wildlife resources. Furs were a symbol of wealth and nobility in Europe. By that time, fur-bearing animals had become scarce in Europe. Louisiana and New Orleans not only offered the opportunity to trap furs in the large delta region, but also acted as a port of trade for the fur industry of the entire Mississippi Valley. From the time of its founding in 1720, New Orleans became a major fur center. Buffalo, deer, bear, otter, lynx, and fox hides and pelts were all shipped to Europe through the port of New Orleans. In 1763, two New Orleanians, Pierre Laclede and Auguste Chouteau traveled up river to set up trade with the Indians in the Mississippi Valley. They constructed a small fort and trading post where the Mississippi and Missouri Rivers merge. The small fort grew to become the city of St. Louis.

Evidence exists that the muskrat occurred in Coastal Louisiana marshes as early as 10,000 years ago. The muskrat did not become prominent in the fur trade until the 1900's. Early trappers trapped mink, otter, and raccoons in the 1800's; they also hunted alligators (See www.alligatorfur.com/education/edumaterials.pdf for printable lessons and activities on Alligators). Alligator hide boots, shoes, handbags, etc. where in great demand in Paris. By 1960, the alligator population was at an all time low and the reptile neared extinction. A law was passed in Louisiana in 1963 that

made it illegal to kill or hurt alligators in anyway. Louisiana legalized the controlled harvesting of alligators in 1972 and the reptile is no longer in jeopardy of perishing.

Alligators have dens, which they occupy usually during the winter. The alligator hunters began burning the marsh as a way to find the alligator dens. The burning brought a change in the type of vegetation, favoring three-corner sedge, the preferred food for muskrat. By 1910, the first serious muskrat trapping in Louisiana had begun. Muskrat populations grew at such a rate that in 1912 cattle ranchers in Cameron Parish were paying a bounty of five cents a pelt for them.

By 1912, fur trapping had become important enough for the state legislature to impose a closed season on mink, otters, muskrats, and raccoons. The law stipulated that these animals could be taken only by licensed trappers and only from November 1 to February 1.

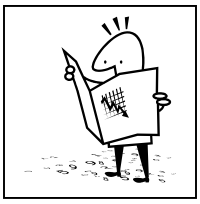
The first statistics on the fur industry in Louisiana were kept for the 1913 trappers' season. The report by the Department of Conservation indicates that 5 million pelts were trapped; more that 4.25 million were muskrats.

And Then Came the Nutria: Part One

Several significant events occurred during the late 1930's, early 1940's to launch a new breed of fur bearing animals into Louisiana wetlands. The nutria rat originally from Argentina, was brought to Louisiana by farmers who sought to make a profit with the fur and meat of this animal (See Figure 6.). One of the more famous nutria farmers was Edward Avery McIlhenny, the Tabasco hot sauce magnate. He was blamed for single-handedly introducing the nutria to Louisiana. This legend can finally be put to rest. In 2002, Shane Bernard, a family historian, discovered the truth about how the nutria came to run rampant in Louisiana. He researched records that showed that E.A. McIlhenny was not the first nutria farmer in Louisiana. At first many farmers bought nutria in Louisiana, looking at them as a business investment. After several years of nutria fur being popular throughout the world, the demand receded drastically. The nutria were intentionally let loose by nutria farmers. The full account is found on pages 51-54.

picture by W.L. Berry, LL&E

Figure 6. Nutria (Myocaster coypus).



The Times-Picayune (09/29/2002)

Nutria tales: The rat's out of the bag: Tabasco mogul didn't bring rodents here

For decades, Tabasco hot sauce magnate E.A. McIlhenny has been single-handedly blamed for introducing nutria to Louisiana.

Legend has it that in 1937, McIlhenny brought 13 of the orange-tooth rodents from Argentina to his home on Avery Island, in an effort to diversify Louisiana's fur industry. Three years later, a hurricane blew down his nutria pen, and the fast-breeding rats escaped to begin reproducing and chomping through the state's fragile marshes.

Now, a historian for the McIlhenny family says the account – perpetuated in part by McIlhenny himself – is more folklore than fact.

The real story, according to McIlhenny's personal records, is that the self-taught biologist and businessman was neither the first to breed nor the first to release nutria in the state, and was just one of several nutria farmers experimenting with foreign fur-bearers in the 1930s and '40s.

"I had heard the traditional story about E.A. importing the nutria and figured since it was my job to be the family historian, it ought to be easy enough to prove," said Shane Bernard, who recently published findings in the journal Louisiana History. "So I started looking through his files and began to notice, almost immediately, discrepancies with the story. What I found disputed things even the McIlhenny family itself had come to believe."

Source began in Abita

It was actually 1938 when McIlhenny, son of Tabasco owner Edmund McIlhenny, bought his first clan of the giant swimming rats: 14 adults and six kits for $112.

And despite his tale that he imported the rodents from Argentina, records show that McIlhenny bought the nutria from a farmer in St. Bernard Parish via a New Orleans fur dealer. Though the farmer's name was not in McIlhenny's records, a narrative account of the sale and the name of the dealer who facilitated the purchase, A. Bernstein, are detailed, Bernard said.

A second nutria farm, this one operated by Henry Conrad Brote in St. Tammany Parish, also appears to predate McIlhenny's colony, according to a letter from Brote's wife found in McIlhenny's records.

Brote was a merchant marine officer who imported 18 nutria from South America in 1933, according to his personal cargo logs, now housed at the Earl K. Long Library at the University of New Orleans. He and his wife, Susan, raised the rodents in brick pens with the hope of selling the animals to fur dealers. When they failed to make money, however, they released the nutria in 1937 into the wild near their home on the Abita River just outside Abita Springs, according to a letter Susan Brote sent McIlhenny in 1945 and a letter that her daughter, Pat Rittiner, wrote to The Times-Picayune in 1988.

A third nutria colony might have been present about the same time in St. James Parish. According to a trapping log housed at UNO's library, the Lutcher & Moore Cypress Lumber Co. recorded the sale of one nutria pelt on Jan. 5, 1941, to fur dealer Bob Itzkoff on Decatur Street in New Orleans. Louis Bezee, on company land, had trapped the nutria during the 1940-41 winter hunting season, the log shows.

Hurricane story hot air

History soon became muddled; however, because of McIlhenny's penchant for boasting that he was responsible for introducing the fur-bearer to Louisiana's thriving trapping industry. His assertion was even published in 1945, when The Times-Picayune printed a letter McIlhenny wrote to a member of the Houma-Terrebonne Chamber of Commerce stating: "I originally brought 15 pairs of the animals from the Argentine…and have liberated probably 150 pairs of these animals in Iberia Parish since 1940."

The letter came as no surprise to Bernard.

"He was well-known on the island for his gift for spinning yarns," Bernard said. "I think he saw himself as an entertainer when relating his personal history. He took liberties in a good-natured way, and because the nutria became so successful, I think he was eager to take credit for their success."

McIlhenny did become a major contributor to the propagation of nutria into the wild, a release that, contrary to folklore, had nothing to do with the hurricane that struck that year, Bernard said. McIlhenny wrote in a memo that he "liberated" 21 nutria, seven males and 14 females, on Avery Island for one reason: to bolster the fur industry. His records contain no documentation that the hurricane damaged the nutria pen or that any nutria escaped, Bernard said.

A year later McIlhenny's plan appeared to be working. Trappers reported capturing 41 nutria on the island, and the number would quickly boom to thousands by the end of the decade.

Changing fashions

During the next few years, McIlhenny continued to sell breeding stock and share in the fur profits from nutria trapped on his property. Then, in 1945, he decided to release his entire colony into the marshes on his land in Iberia and Vermillion Parishes, Bernard said. The release likely included hundreds of full-grown nutria, Bernard said.

McIlhenny died in 1949, leaving behind the legend that he alone introduced nutria to Louisiana.

But the designation, however enviable at the time, would eventually tarnish the family history.

In the late 20th century, Louisiana trappers all but stopped hunting nutria because the price of the pelts plummeted. The overall fur market had bottomed out because of fashion changes, the anti-fur movement and global saturation of the market.

With no human predators, the nutria population exploded, and the voracious vegetarians began chewing their way through the grass of the state's coastal wetlands, marshes and drainage canals – exacerbating the growing problem of Louisiana's disappearing coastline.

In Jefferson Parish, the nocturnal "rats" soon became Public Enemy No. 1, with officials scrambling for ways to control their numbers. Some measures seemed downright laughable: Sheriff Harry Lee assembled a team of sharpshooters to hunt nutria in drainage canals, and state officials started a campaign to encourage residents to begin eating more nutria meat.

But desperate times called for desperate measures.

Record finally set straight

As the controversy over nutria grew, newspapers and magazines continued to repeat the story of E.A. McIlhenny, to the consternation of his descendants.

Ned Simmons, McIlhenny's grandson and the President of Avery Island Inc., said he always suspected the story was not entirely accurate. So when Bernard approached him with a proposal to research the subject, he welcomed the idea.

"With any company like ours, myth, error and falsification gets woven into the story and gets repeated until it becomes fact," said Simmons, 74.

Simmons had no illusions that the research would clear his family of all association with the marsh-eating rodents. He readily admits his grandfather's role in bringing the species to the state. In fact, Avery Island is still full of nutria, he said.

"I asked Shane to tell us the truth as you find it," Simmons said. "Our interest was not in anything but trying to set the record straight."

…….

By: **Martha Carr** may be reached at mcarr@timespicayune.com.

Extra! Extra! Read All About It!

After reading the selection and researching a topic on the Internet:

1. You will be creating a newspaper front page on one of the following topics:
   - Louisiana Fur Industry
   - Louisiana Crop Industry
   - Louisiana Nutria Industry

2. You must have the following information on your front page:
   - Title of the Newspaper (This is called a banner)
   - Date (Month, day, and year)
   - One or more pictures associated with your topic
   - One of your articles must be on your topic and at least 150 words (Who, What, When, Where, Why or How)
   - An advertisement (Something for sale related to your topic)

SAMPLE:

LA TIMES
October 24, 2005

Louisiana Alligators

For Sale:

Alligator Meat

Only **$6.00** a pound

And Then Came the Nutria: Part Two

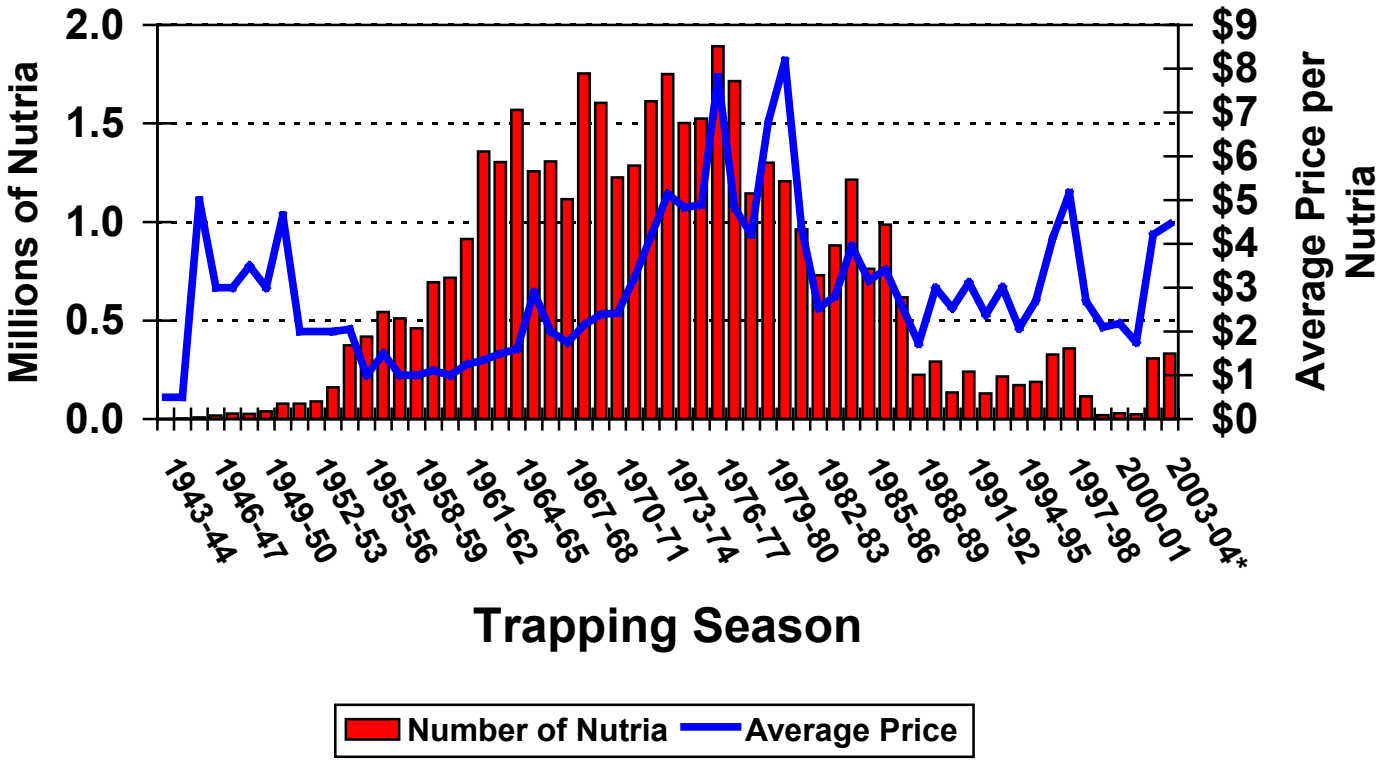
The population of nutria in coastal Louisiana reached its peak between 1955 and 1959, when it was estimated 20 million nutria lived in Louisiana's coastal marsh. The meat was used for everything from mink food to human consumption. During the mid 1950's reports started coming in describing the damage done to marshes, rice and sugarcane fields, and levee systems, as the nutria population increased. Biologists described areas where nutria had completely denuded natural levees at the mouth of the Mississippi River. The marsh had been weakened by severe over-grazing, and then in 1957, Hurricane Audrey hit southwestern Louisiana. Its storm surge weakened the marsh as a huge wave of seawater pushed thousands of nutria inland, accelerating the rate at which the animals spread (See www.nutria.com/site2.php). In 1958 nutria were taken off the list of protected wildlife (Figure 7.).

The LDWF (Louisiana Department of Wildlife and Fisheries), with the help of BTNEP, conducted aerial wetland damage surveys in 1993, 1995, 1996, and 1998-2002. Survey results clearly noted nutria damage is concentrated in the Deltaic Plain in southeastern Louisiana. This indicates high nutria populations that are exceeding the local carrying capacity. In 2000, the U.S. Congress passed an appropriation to address Brown Marsh Dieback and to provideresearch studies on nutria.

The Coastal Wetlands Planning, Protection, and Restoration Act, also known as the Breaux Act, (see BTNEP CD Thibodaux Treasures) has provided grant funding for coastal restoration and conservation. In 2002, a final report on Nutria Control Methods was completed by the Louisiana Department of Natural Resources. After reviewing a number of possible methods to reduce nutria, the report concluded that the best method of reducing nutria was an incentive payment program. Nutria hunters would be paid t kill nutrias. In 2004, the going rate for a nutria tail as proof of the animal's demise was $4.00. The goal of the program is to encourage the harvest of up to 400,000 nutria annually from coastal Louisiana.

Let's go back in time and see how the earliest trappers used the marsh for a source of income and some of the obstacles they faced. To reach the deep marsh the trappers would dig small ditches through the marsh called a "trainasse." The trainasse allowed the trapper access to the deep marsh. The trapper generally worked a lease of 100 to 300 acres setting out 250 traps. On a good day he would catch 80 to 90 muskrat, which he would skin on the spot. He would then take the pelts back to his cabin and place them on drying fames.

LOUISIANA NUTRIA INDUSTRY
HARVEST AND AVERAGE PELT VALUE



1. This figure includes the CNCP $4.00 incentive payment that began in 2002-2003. Graph by: Jeff Marx (LDWF)

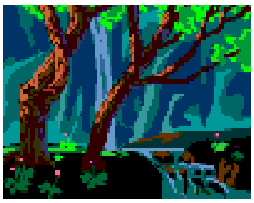
Figure 7. Figure annual harvest and average price of nutria from 1965-2004.

Every two weeks or so the land manager would visit the cabins in a boat bringing provisions and taking away dried pelts. The highlight of the season came with the big sale at the end of the season. The buyers would bid on each trapper's lot and submit it to the land manger as a sealed bid.

The modern fur industry has changed a great deal. Today's trappers act independently, dealing directly with the buyer. The trapper may operate as many as 300 to 400 traps on a lease that may reach several thousand acres. Most of the marsh cabins are gone, with the trapper taking each day's catch home for processing. Between 1947 and 1967, the number of fur dealers dropped from 40 to 21, the number of buyers from 263 to 128, and the number of trappers from 12,000 to 5,000. The numbers for the 2003-2004 season show that there were 14 fur dealers, 42 licensed fur buyers (only 5 actually bought furs), and 1,432 licensed trappers.

The pelts are used for making fur coats, jackets, and hats all over European countries. The meat is considered a delicacy in restaurants in Europe. The Far East, China, Korea and other Pacific Rim countries also are very interested in the nutria meat. These countries are considered to hold great market potential for Louisiana. Locally, Chef Philippe Parola and others have come up with a number of recipes that use nutria meat. Even the Louisiana Coastal Wetlands Conservation and Restoration Task Force has come up with a plan to promote the eating of nutria. "Eat a Nutria, Save Louisiana." After all, Nutria eat only vegetation, so the meat is similar in taste, texture and appearance to rabbit.

A Coastal Nutria Control Program has also helped in the Barataria-Terrebonne basins. Here enclosures, similar to fencing, are used to keep the nutria out of certain areas. This strategy has been very effective. (nutria.com/site5.php).



Healthy Estuary, Healthy Economy Healthy Communities

Focus/Overview

This lesson focuses on students utilizing graph & reading skills. Members of the BTNEP Management Conference selected 10 Focus questions and 34 indicators to present an overview of the environmental health of the Barataria-Terrebonne Estuary System. An environmental indicator measures the condition or health of a natural resource. Watching this measure change over time can tell us about changes in the condition of the natural resource.

Learning Objective(s)

The learner will:

- Read several types of graphs
- Answer critical thinking questions
- Identify key issues of the Estuary

Louisiana Grade Level Expectations

7-GLE-1	Analyze various types of maps, charts, graphs, and diagrams related to U.S. History (G-1A-M2)
7-GLE-34	Explain how environmental factors impact survival of a population (LS-M-D2)
7-GLE-39	Analyze the consequences of human activities on ecosystem (SE-M-A4)
8-GLE-8	Identify and describe factors that cause a Louisiana region to change (G-1B-M3)
7,8-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)

Materials List

- Go online at www.btnep.org to order classroom sets of BTNEP publication: **Healthy Estuary, Healthy Economy, Healthy Communities ….**

Background Information

The LEAP and ITBS test have; many graphs and charts that the students are expected to read and answer questions. The charts, diagrams and graphics can be used to access weaknesses and strengths.

BTNEP Connection
Habitat, Barrier Island, Changes in Living Resources, Water Quality, Economic Development

Grade Level
7,8

Duration
Two 45-minute classes or 90-minute block

Subject Area
History, Geography, Science, Language Arts, Math

Extension Areas

- INTECH lesson (see resources)
- Students create their own graphs with information supplied by the teacher.
- Cooperative groups work together to present an issue using a graphic organizer.

Vocabulary

- Estuary
- Environmental Indicator
- Graphic organizers

Original Source (if applicable)

- Cally Chauvin
- BTNEP
- Healthy Estuary, Healthy Economy, Healthy Communities …

Advance Preparation

- Order free BTNEP publication: **Healthy Estuary, Healthy Economy, Healthy Communities,** or download the pdf file**. (**btnep.org**)**
- Provide notes on types of graphs

Procedure

1. Have students look through the publication **Healthy Estuary, Healthy Economy, Healthy Communities …**
2. Have the students make comments on how many different types of graphs the publication has. Write them on the board. Go over types of graphs and give notes.
3. Divide the students into pairs. Assign each group a different graph and section.
4. Their job is to become experts on their assigned section. The students must explain their section to the class using their graph as a visual aid.
5. After each group of students has presented their graphs and findings, hand out the Activity sheet.
6. Show the commercials on Wetland Loss at: http://www.americaswetland.com/custompage.cfm?pageid=2&cid=13
7. Have students compare each commercial. Ask the students, "Which one impacted you the most? Why? How can a commercial or advertisement be used to bring your groups information to the public?
8. The above activity can be done as a group or as a culminating activity. The students can create advertisements on their sections.

Blackline Master(s)

1. **Healthy Estuary, Healthy Economy, Healthy Communities …** Activity Sheet

Assessment

1. Complete the **Healthy Estuary, Healthy Economy, Healthy Communities …** Activity Sheet.

Resources/Websites

www.btnep.org

- ✓ **Healthy Estuary, Healthy Economy, Healthy Communities …**
- ✓ **Saving Our Good Earth: A Call to Action**

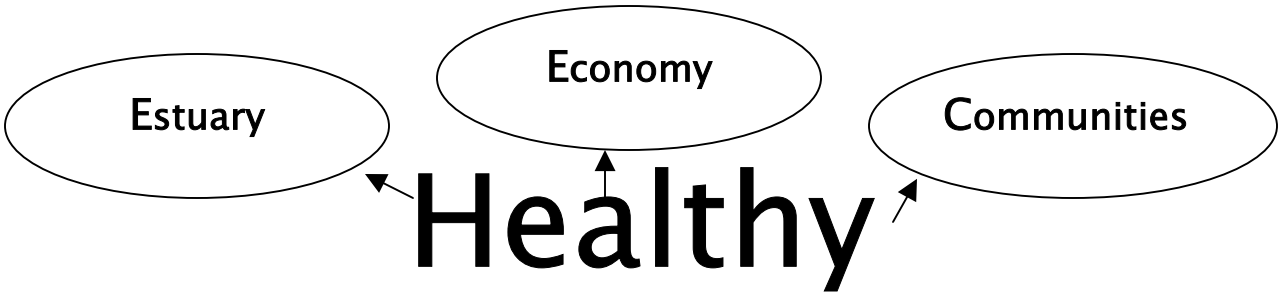
http://www.leeric.lsu.edu/index3.htm- INTECH Lesson

www.nutria,com

Tradebooks:

Morcos, Ann Conti. The Tale of Nada Nutria. This book is aimed at 8-12 years olds, but its serious moral nature will appeal to all ages.

Lockwood, C.C. Louisiana Nature Guide. Students of all ages will enjoy the graphic pictures and wonderful sights of Louisiana.



Activity Sheet

(Information Strategies)

Directions: Using the Booklet: **Healthy Estuary, Healthy Economy, Healthy Communities** … complete the following:

1. What focus question deals with threatened and endangered species?

2. Locate the indicator on oyster harvesting. What year of closure is represented on the Louisiana outline map?

3. How does the state of Louisiana rank in the nation for overall production of seafood?

4. Find indicator 12. What is the difference between fresh water salinity and gulf water salinity? Would you find Blue and Channel Catfish in the gulf water area? Why or why not?

5. How many parishes represent the BTES area? Where did you locate the information?

6. What are two ways that you can help restore and enhance the BTES?

7. What page can you find all of the focus questions and associated environmental indicators? To what part of book can you compare this?

8. What is the difference between the land versus open water in the BTES (Barataria-Terrebonne Estuary System) from 1956 to the year 2000? What effect do you think this will have on the fish and wildlife?

Louisiana Seafood

As interest in the development of the fur industry grew, so did the interest in a commercial fisheries development. From early colonial times shrimp species were plentiful on the New Orleans market; and no doubt the common names of these, "river shrimp" and "lake shrimp", originated in that city. The term "lake shrimp" referred to the most plentiful of our migratory salt-water species, the young of which appear in lakes every summer, sometime in great schools.

Early methods of taking shrimp consisted of cutting a burlap sack in half and placing a handful of corn meal inside the sack. The sack was then suspended slightly below the surface allowing the shrimp to enter the sack and feed on the corn meal. Later methods included dipping or dragging hoop nets and the development of the use of seines. The early fisherman would use seines of about 120 feet in length and 10 feet in width. One man with a rowboat would circle out and back to a lugger, trapping the shrimp in a net.

Seiners who ventured outside, along Grand Isle beaches, or near the mouth of Bayou Lafourche at Fourchon, long recognized a small sea shrimp which they referred to as "Six Barbe" or "six whiskers." This name was gradually corrupted to "Sea Bob", which is what they are now called. (See **Estuary Live** Video Clip) Large catches of Six Barbe or Sea Bob were made by seining the beaches during favorable weather. The bulk of the Sea Bob catch was dried in the sun on the drying platforms, which dotted the coastal bayous and was shipped to Chinese colonies and over the world (See BTNEP Video Clip 15).

Early shrimp and shellfish were wrapped in moss to keep cool while being transported. Iceboats came after the turn of the century. Also, about this time, gasoline engines slowly came into use. True commercial shrimping did not begin until 1915 with the introduction of the otter trawl from North Carolina. With the advent of power boats and the development of sea-going trawlers, the shrimp grounds were extended, and both drying and canning industries grew by leaps and bounds. Commercial production went from half a million pounds in 1880, to 16 million pounds in 1919, and 32 million pounds in 1920. In 1917, there were 300 seines and only four trawls operating commercially in Louisiana. In 1937, there were 2,313 trawls and 35 seines operating.

Due to the development of refrigeration, new methods of harvesting, canning, packing, new preserving techniques, and rapid transportation, Louisiana shrimp were

reaching world-wide markets never dreamed of before. Today, shrimping is no longer a matter of going out in a small boat and bringing back a payload. Trawler hull designs have been changed, and gear has been developed to handle shrimp faster. Navigation aids such as radar, GPS, fish finders, ship-to shore radio, fathometers, computers, and other high tech gear are now in the reach of not only the big operators, but also the small independents.

Louisiana ranks second in the nation in commercial fisheries production and second in the nation in the value of production. Louisiana's 1980 fisheries production was valued at $750,000,000. Lafourche Parish 1980 seafood production was 20.3 million pounds and valued at $34,000,000. This rate has increased to 26 million pounds and was valued at $31,000,000 in 2002 (LDWF 2002). Out of the Gulf States, which include Florida (West Coast), Alabama, Texas, Mississippi, and Louisiana produces 76% of all seafood production. Louisiana is also responsible for 14% percent of the United States seafood production (Fisheries of the United States 2002). This industry is not based solely on shrimp production. Menhaden, crab, oysters, redfish, speckled trout, white trout, and sheephead are all major contributions to the seafood industry.

These species are also dependant on Louisiana's estuarine coastal marsh, which acts as a nursery ground for Louisiana's seafood industry. Loss of Louisiana's coastal marsh places the entire commercial seafood industry in jeopardy through lowering water quality by allowing faster run-off of domestic pollution, and the physical loss of the nursery and food production areas for commercial and sport species. Fisheries production is related to the acreage of marsh in the estuary. Marsh loss does not correlate one-to-one with fisheries loss. As land loss increases you will notice a temporary increase in fisheries production due to a short-term increase in nutrients provided by the deteriorating marsh.

Residents of Louisiana have long overlooked the value of their coastal marsh. From the time of the earliest settlers, we have attempted to reclaim and manipulate the swamp and marsh areas. The coastal zone area of Louisiana does not easily lend itself to habitation or cultivation. It has become necessary from colonial times to build levees in order for us to inhabit and farm many areas of Lafourche Parish.

Shrimp and Shellfish

After reading the selection, complete the worksheet

1. Using a Venn diagram or other graphic organizer, compare the early methods of catching shrimp to what they do today.

2. Complete the following data charts with the information below. Then answer the questions.

Commercial Production

Year	Million lbs

Seines and Trawls

Year	Seines	Trawls

Commercial production went from half a million pounds in 1880, to 16 million pounds in 1919, and 32 million pounds in 1920. In 1917, there were 300 seines and only four trawls operating commercially in Louisiana. In 1937, there were 2,313 trawls and 35 seines operating.

a. What did you notice about the commercial production? Why do you think this occurred?

b. What did you notice about the seines and trawls? Why do you think this occurred?

Louisiana Sugar Industries

As the Acadian immigrants arrived from 1765-1785, they received land grants from the Spanish government. A provision of these land grants was that those residents living along bayous and rivers were to build and maintain a levee on their property.

Etienne de Bore was granted Laurel Valley Plantation in 1775. Laurel Valley is the largest nineteenth century sugar plantation complex still surviving. In 1795, Etienne de Bore developed the vacuum pan process for granulating sugar. This established the sugar industry in Louisiana, and increased the demand for agricultural land.

Here in Lafourche Parish, we have our own sugar empire. The Raceland factory began operating as a then modern, large sugar factory in 1892. It operated under the name of Leon Godchaux Company, Limited. The L.G. logo and plaques of 1892 and 1894 are still in place on some of the old buildings.

In the early operations, Raceland was grinding about 100,000 tons of cane per year. Increasing equipment size and type over the years in the 1930's; 300,000 tons in 1961; 400,000 tons in 1976; 500,000 tons in 1981 and can process over 600,000 tons of cane per year today.

During the one hundred years that Raceland factory has been a central factory, it has led the state in tons on cane ground per year for thirty-five of these years. Most recent was the 1990 harvest season where 570,000 tons were ground.

The name of the company changed to Godchaux Company, Inc. in 1914 and to Godchaux Sugars, Inc. about 1929. The number of sugar cane processing factories in Louisiana has changed from 746 in 1889 to 20 today.

The Leon Godchaux family continued to run the Raceland factory until 1956. At which time, after a prolonged workers strike at the Reserve Refinery, the family sold some of its assets. One of the sales was the Raceland mill and farm lands to Gulf States Land and Industries. In 1958, The South Coast Corporation, the largest Louisiana sugar company, purchased the Raceland factory and its farmland. Under the South Coast Corporation ownership, many major improvements were made allowing the factory to eliminate one of the two grinding tandems so that all cane

processed could be handled on one large modern tandem beginning in 1964. Improvements and expansions continued during the late 60's and during the 70's.

In 1979, The South Coast Corporation, a subsidiary of Jim Walters Corporation, sold its holding to a group of three investors. In 1980, these investors divided the South Coast holdings. The Raceland factory became known as South Coast Sugars, Inc. During the early 1980's, the company installed a dual can core sampling system, a bagasse reclaimation system, and a 2,000 cubic foot vacuum. The Raceland factory continued to increase its capacity in the 1980's. The daily grinding rate increased from 6,000 tons in 1979 to 8,272 tons in 1990.

The Raceland factory continues in operation after having gone through floods, depressions, world wars, hurricanes, cane disease, and bad economic periods. The latest of their major obstacles was the near closure of the Raceland Mill in 1991.

In 1991, South Coast Sugars ran into financial difficulties. The Raceland factory was saved from being closed permanently when Savannah Foods & Industries, Inc. of Savannah, Georgia, purchased certain assets of South Coast Sugars, Inc., mainly the Raceland Mill. The name was officially changed to Raceland Sugars, Inc. In its first year of operation under Savannah, $3.5 million of new capital items have been approved and are being installed. These include a 150,000-pound boiler, complete automation of the pan floor, centrifugals, and a 1,300 horsepower seven-foot mill for the 1993 harvest season. Also, for its farm operations two of the most modern two-row cane loaders, harvester, transloader wagons, and cultivation equipment have been put into use.

This factory and its related operations have provided jobs, livelihoods, and security for many people and families over the last one hundred years. Raceland Sugars, Inc. goal is to again lead the state in cane ground and sugar per ton recovered.

Sugar Time

Create a timeline on the information provided in the reading selection of the Louisiana Sugar Industries. Include the following: all-important events and people, a title, and several images (pictures, drawings).

Louisiana Oil Industry

Humans manipulated the Louisiana coastal marsh through the development of an efficient and economical water transportation network. Within Lafourche Parish, canals were dredged and dug by hand to connect area lakes with Bayou Lafourche. Foret's canal, above Raceland, leads to Lake Bouef. The Company Canal extends from Lake Salvador on the east bank of Bayou Lafourche through Lockport to the Intracoastal Waterway south of Lockport. The Intracoastal Waterway was dredged connecting existing canals, bayous, and lakes from Texas to Florida. In the South Lafourche area, the Clovelly Canal led from Little Lake to Bayou Lafourche, as did the Breton Canal (See Figure 8).

The rise of oil prices from $.81 per barrel in 1907 to over $30.00 a barrel in 1985 led to a broad search for oil and gas throughout Louisiana's coastal marshes (See the CD 100 years of Oil & Gas and Black Gold Beneath the Bayous; can be downloaded free at www.osradp.lsu.edu/). Heavy drilling and production equipment could not be moved through the soft marsh, so location canals were dredged. Throughout the 1930s, some 45-90 percent of wetlands loss was due to canal dredging. In 1926, south Louisiana produced 4,162,817 barrels of oil, or one-sixth of the entire state's output. The Leeville and Golden Meadow fields were two of the most active fields in south Louisiana. The Bay Marchand field, just offshore of Fourchon, was among the first large scale offshore oil fields. Its output led to the success of Chevron Oil Company.

In the Louisiana of the 1930's any industry to help the impoverished state was welcomed. The state had few paved roads, a poor school system, and little electric power in the rural areas. The state government was ready to wed any industry, which provided jobs and money. The oil industry was the welcomed savior to the government. But the local inhabitants of the oil producing areas of South Lafourche did not share that view of the incoming foreigners and their industry. It was a cultural conflict of poor, hardworking, Cajun fisherman and their families colliding with the well-paid, hardworking, American roughnecks.

The oil industry had developed land-based methods and operations in Oklahoma and Texas. But in Louisiana, much of the oil was under water. The state and national government received revenues of hundreds of millions of dollars, some of which began modernizing rural Louisiana. The government encouraged and assisted offshore oil development with little or no restraints toward the local populations or the environment. Outside of the obvious localized oil pollution, no one understood the significant environmental problems being created.

picture by: N.N. Rabalais

Figure 8. Canals, Areas of Dredging and Waterways

The Leeville and Golden Meadow areas were crisscrossed with location canals (See www.wetmaap.org – download map and pictures.). The immediate environmental destruction was of little perceived cost compared to the local jobs and state funds generated. Even a well blow-out in Golden Meadow which contaminated the drinking water and forced evacuation of the town for weeks did not slow or interfere with oil exploration in the wetlands.

The state of Louisiana and its population were happy to allow the oil industry to work unbridled as long as the revenues to the state continued to subsidize progress. The population accepted the environmental and cultural problems because oil kept taxes down and provided money, roads, and other community improvements.

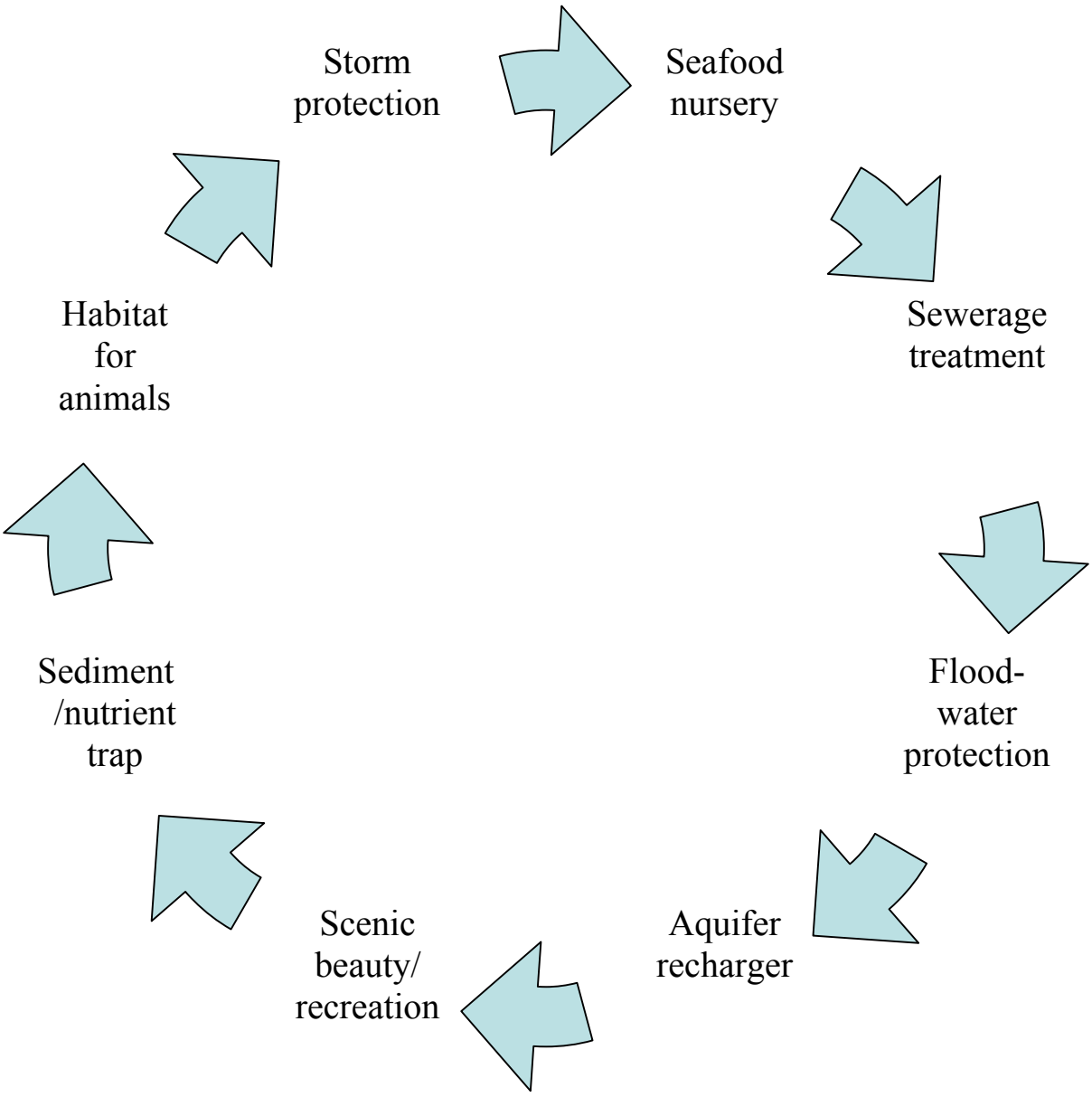
The damages done to the environment by the oil industry and canal digging had become apparent only after the environmental movement of the late 1960's created awareness. Before that time, people accepted environmental loss as only a minor problem. It also became evident from biological research in the 1950's, 1960's, and

1970's that the wetlands were not wastelands, but some of the most biologically productive areas on earth.

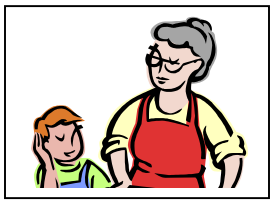
Humans have contributed to the acceleration of coastal land loss in a variety of ways. What does this loss of land mean to Louisiana and its people? It means a loss of jobs, millions of dollars in lost income, and a decline of an aesthetically pleasing area of the state. This progressive loss is a menace to the state's million-dollar seafood, fur, and alligator resources. It represents a reduction of the nation's most valuable winter habitat for waterfowl and migrating bird life (see BTNEP Migratory Bird Poster). Louisiana's coastal wetlands provide habitat for over 5 million migratory waterfowl (LDWF 2002). Loss of revenues from offshore mineral activities is occurring. It was estimated that for every mile Louisiana's shoreline moved inward, the state lost $35 -$40 million in oil and gas revenues, before the state's boundaries were set. Sport fishing along the coast for saltwater species could be altered drastically due to loss of essential nursery areas. The coastal marsh and barrier islands act as a buffer against the tidal surge pushed ashore by hurricanes and storms. In short, the very livelihood of Louisiana and its rich customs and traditions are at stake. The generations of the past and future must be careful not only to correct the mistakes of the past but also not to compound them by ineffective means.

We have established that Louisiana's natural resources are rich, and vital to our state's people and economy. We have seen that we have acted carelessly in the use of these resources. We can also see that our responsibility as citizens of this state call for us to take the leadership in finding a solution to these problems. The following graphic organizer shows the functions of the Wetlands.

FUNCTION OF THE WETLANDS
Visual Graphic
(PROJECT CEED-UNO/LNSC)



Adapted from: Wetland Blues: A Video Guidebook for Teachers. Second Edition. Project CEED. -UNO/LNSC



When You Were My Age

Focus/Overview

This lesson focuses on oral history. Oral history reflects the true experience of a people. It affords an opportunity for students to communicate with those who have witnessed the current history of an area. This activity will help history to come alive for your students.

BTNEP Connection
Cultural Heritage

Grade Level
8

Duration
45-minute classes

Subject Area
History, Geography, Language Arts

Extension Areas
Extension area detailed in the activity/lesson.

Vocabulary
- Interviewing

Original Source (if applicable)
- When You Were My Age… An Oral History Project on Bayou Lafourche
- Cally Chauvin

Learning Objective(s)

The learner will:

- Interview a person who lived along Bayou Lafourche
- Orally present their findings
- Publish their work through BTNEP

Louisiana Grade Level Expectations

8:GLE-4	Describe & analyze the distinguishing physical and/or human characteristics of a Louisiana region (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)
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 environment on its inhabitants (G-1D-M2)
8:GLE-67	Analyze historical data using primary and secondary sources (H-1A-M4)
8:GLE-75	Locate and describe Louisiana's geographic features and examine their impact on people past and present (H-1D-M4).

Materials List

- download When you were my age… booklet

Background Information

Coastal Louisiana had witnessed dramatic changes in its environment, economy, and population trends in the twentieth century—many of those who have witnessed these changes are still living. This project brings the history of Bayou Lafourche to the students.

Advance Preparation

Copies of When you were my age… booklet at
http://educators.btnep.org/client_files/editor_files/When%20You%20Were%20My%20Age(2).pdf

- for each student
- Tape recorders (to check out)

Procedure

1. Follow guideline in the Booklet.

Blackline Master(s)

1. When you were my age booklet

Assessment

1. See Criteria Sheet

Tradebooks:

Looper, Robert B. The Cheniere Caminada Story. 2003. Excellent historical information and actual stories of what happened to the people and area before and after the hurricane. The pictures and images provide an in depth look at life during the late 1800's.

Websites/References/Resources:

- ✓ Contact www.btnep.org for poster: Claudette's **For True or What?** Or download individual images by Wallace Faucheux – historical and factual information about the Barataria-Terrebonne Estuary area.
- ✓ Read the oral history story entitled, "A Bit of History: The Cut Off Canal and the War of 1812," to your class by Roland and Lou Ann Guidry.

A Bit of History:
The Cut Off Canal and the War of 1812

Originally submitted by: Roland and Lou Ann Guidry

A historical marker now designates the site of the Cut Off Canal from which the community of Cut Off derives its name. The canal is located on Highway 308 on the east back of Bayou Lafourche. Excavation was begun in 1865 and completed in 1857, and it was used primarily as an outfall canal. Originally built thirty-five feet wide and five feet deep, it is now only twelve to fifteen feet wide. For many years, the canal was overgrown and half filled with debris. The present owners, Mr. and Mrs. Roland Guidry, and Mr. Kirk St. Pierre, have cleaned the canal and it is once again functional as a drainage canal.

For over a thousand years, Bayou Lafourche flowed from the Mississippi River to the Gulf of Mexico at Fourchon. In 1814 Bayou Lafourche was 15 to 20 feet deep and carried rich alluvial soil, which it deposited along the banks of the bayou. Green trees, mostly willows, grew along the banks.

During the War of 1812, General Andrew Jackson made a military decision that altered the flow of Bayou Lafourche. In 1814 he ordered that trees be cut down along the banks and be placed into the deep waters of the bayou. These obstructions covered a long distance. Its purpose was to prevent the ascent of the British navy to Donaldsonville via Bayou Lafourche, then on to the Mississippi River, which would have enabled the British to attack New Orleans. Fortifications were built of earth and logs on the banks of the bayou and manned by troops and local militia.

After the war ended in 1815, the soldiers left but the obstructions remained. Silting began and eventually the bayou was only two and one half to three feet deep for several miles. This prevented large steamboats from traveling down the bayou and only the small vessels could sail or cordell up or down the bayou.

The obstructions caused a lot of silting, which slowed the flow of the bayou. Consequently, water rose higher and higher and “Crevasses” occurred, flooding plantations along its bank. Plantation owners complained that flooding was ruining their crops and something had to be done.

State and federal engineers made several suggestions: build locks at Donaldsonville, dam the bayou, or cut outfall canals to relieve the flooding. It wasn’t until 1854 that State Engineer, Lafayette Caldwell drew up plans for an outlet canal.

This “cut off” was to be dug on the northern edge of a plantation owned by a Mr. Para located about fifteen miles below Lockport.

In 1856 the dredge boat Harmanson was sent to commence the excavation of the “cut off” outlet. This vessel was not well suited for digging canals so work progressed slowly. Repairs and adjustments were made which increased production, so that in August of 1857 the Harmanson finished the canal to Bayou de Amourous. The people of the area soon adopted the name of Cut Off for their community.

While this outlet canal helped to alleviate flooding, it did not solve the problem; the obstructions still remained. It was not until 1873 that Congress authorized funding to remove the obstructions and not until 1879 that actual funding was approved.

The Corps of Engineers set Lt. O.T. Crosby to oversee the operation. State vessels and employees were used to do the work. From 1881 to 1885 over thirty miles of obstruction and sediment were removed from below Lockport to a point below Cut Off. The spoils were used as a foundation for both Highway 1 and Highway 308.

In the course of time, the Cut Off Canal served many purposes. First, to disperse floodwaters, then as a temporary route to Little Lake, and it is even rumored to have been used during Prohibition. Today the Cut Off Canal is still significant for its rich history, but more importantly, for lending its name to the community.

Components of Coastal Land Loss

Land loss in the coastal zone is a problem with broad environmental and economic consequences. Land loss, which is land turned to water or land covered with water, is a result of many interacting factors such as subsidence, sea level rise, flood control structures, canals and navigation channels, storms and wave action, herbivory, and development. The wetlands of coastal Louisiana are being converted to open water at a rate greater than 20 square miles a year (See www.btnep.org Lower Barataria-Terrebonne Estuarine Basins Habitat Change Map).

The survival of the Lafourche Parish communities depends on the marshes, swamps, and barrier islands that absorb storm surges from the Gulf of Mexico. Every mile of marsh between your home and the Gulf can reduce the depth of storm surges by seven inches. Because hurricane storm surges at the Gulf shoreline can reach up to 20 feet (as was the case with Hurricane Camille near Biloxi), this natural protection is what makes marsh communities like Cocodrie more habitable than areas like Timbalier Island. Without these buffers, storms would regularly flood the communities where most residents of Barataria-Terrebonne live. Of course, if the marshes and swamps disappear, we can always expand the levee system. But even today, the highest hurricane protection levees often cost more than $3 million per mile and rarely exceed 14 feet above sea level. Alternatively, it makes sense to preserve as much of the natural system as we can before we are forced to adopt more expensive, less effective solutions.

As swamps and marshes disappear, we lose the animals that depend on these habitats (See Figures 9 & 10). Our abundant resources of fish, shellfish, and ducks have always allowed families to make a living fishing and trapping when times are hard. Losing this economic cushion would affect all residents of the Barataria-Terrebonne region.

Marshes act as giant filters for pollution and sediment, screening out harmful substances before they damage other habitats. After the sediment has been absorbed, the microorganisms living in marshes can break some of the organic pollutants down. Without the regions vast marshes, we lose their service as natural filters (see BTNEP's Saving the Good Earth: A Call to Action).

The cumulative impact resulting from land loss includes changes in water, which contribute to increase in salt-water intrusion, losses in storm buffering capacity, loss of migratory birds' area, and diminishing nursery grounds for Louisiana's coastal fish and shellfish resources.

Picture by: Diane Baker

Figure 9. Swamps and bottomland hardwood forests are home to deer, Barred Owls, wild turkeys, Pileated Woodpecker, squirrels, bullfrogs, Sac-o-lait, Prothonotary Warbler, Yellow Crowned Night Heron, bass and other wildlife.

Picture by: Diane Baker

Figure 10. Marshes are home to alligators, nutria, diamondback turtles, killifish, Clapper Rails, Great Egrets, Red-winged Blackbirds, Redfish, Speckled Trout, shrimp and other wildlife. There are 4 types of marshes: fresh, intermediate, brackish, and salt.

Oh Where Oh Where,

Have the Animals Gone?

✓ **Choose one of the following animals:**

Deer	Barred Owls	wild turkeys
Pileated Woodpecker	squirrels	bullfrogs
Sac-o-lait	Prothonotary Warbler	bass
Alligators	nutria	Redfish
diamondback turtles	Clapper Rails	killifish
Great Egrets	Red-winged Blackbirds	shrimp
Speckled Trout	Yellow Crowned Night Heron	

✓ **Create a Flyer about your animal**
- **Where does it live?**
- **What does it eat?**

✓ **Include how important the swamps or marsh are to its survival**

✓ **Include an illustration of your animal**

✓ **Include a drawing of its natural habitat**

Subsidence: An Important Factor

Subsidence is the sinking of the land surface caused by a number of factors, including compaction of young sediments, removal of mineral resources from beneath the surface, faulting and warping of the earth's crust, and artificial drainage of the land, which causes physical compaction and oxidation of organic matter (See BTNEP Video Clip Four). Louisiana's coastal zone is very flat, so even a slow rate of land subsidence can result in large-scale disappearance of marshlands if no additional sediment is provided. The lowering of land that occurs in Louisiana can be divided into two general categories: tectonic subsidence and compaction subsidence.

Tectonic subsidence refers to the large-scale downward geologic displacement caused by sedimentary loading and associated settlement process. This type of subsidence is directly linked to the Mississippi River system, which built the Louisiana deltaic plain during the last 7000 years. Beneath the present active delta as much as 1000 feet of sediments have accumulated, with land subsidence rates estimated at 5 to 10 feet per century. Away from the active delta the rate decreases.

The compaction aspect of subsidence is attributed to a variety of causes including overlying weight, subsurface withdrawal, and dewatering. Examples of overlying weight include physical features such as natural levees, man-made levees, buildings, spoil mounds, and even marsh buggy traffic. The net consequence of this overlying weight is the localized surface sinking as sediments are compressed.

Surface withdrawal of oil, gas, and groundwater also contributes to subsidence. The water table is at or near the surface on a wetland environment. When it is lowered because of drainage activities, the dewatered upper soils or sediments are subjected to oxidation, soil shrinkage and wind erosion. Although "natural" factors, such as marsh burning, have been cited as causing soils to dry out and subside, it is primarily human efforts related to urban expansion, agricultural drainage and reclamation, and flood control that have led to widespread localized surface subsidence.

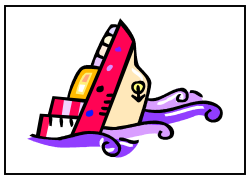
There are two types of subsidence.

1. **Surface subsidence**: This type of subsidence, i.e., soils near the surface sinking, was not a problem in the not too distant past. Though subsidence has always occurred in the delta, each year's high water would overtop the low, natural levees and spread new soil across the river's floodplain. In most

places, the river added more soil than that which had subsided during the year. This resulted in net growth of the delta, so subsidence was not considered a villain, but just a natural process (See Activity: Subsidence Made Simple).

2. **Geologic subsidence**: This is subsidence caused by events deep in the earth. The delta consists of great quantities of sediment laid down over a great layer of salt (called the *Louann salt*) located some five miles below the surface. Huge chunks (fault blocks) of this salt (usually in the shape of polygons) subside, thus causing the surface to subside. Below a line running between New Orleans and the northwest side of Houma, the rate has been 3-4 in per century. This is a phenomenon that is out of human control.

Historically, annual floods over the banks of the Mississippi River provided the freshwater and sediment inputs needed to keep the marshes above water. Leveeing the river, which was necessary to protect our communities from the same flooding events, has eliminated these vital inputs. Subsidence drowns the marsh, causing chemical changes in wetland soils, which eventually kills marsh vegetation. Without the plant roots to hold together, the marsh soil breaks up and is carried away by wave action. Open water is the ultimate result. Barrier islands, which help protect the interior marsh from wave action and hurricanes, are also subject to subsidence and ultimately disappear without new sediment inputs. Subsidence is the most important and most pervasive factor leading to land loss.



Subsidence Made Simple

Focus/Overview

This lesson focuses on subsidence. In order for students to get the a visual picture of subsidence, this activity is easy and fun to complete.

Learning Objective(s)

The learner will:

- define subsidence
- discuss what subsidence does to an area

Louisiana Grade Level Expectations

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)
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 environment on its inhabitants (G-1D-M2)
8:GLE-67	Analyze historical data using primary and secondary sources (H-1A-M4)
8:GLE-75	Locate and describe Louisiana's geographic features and examine their impact on people past and present (H-1D-M4).

BTNEP Connection
Habitat, Changes in Living Resources, Water Quality, Economic Development

Grade Level
8th

Duration
15-minute classes

Subject Area
Science, History, Geography

Extension Areas
Extension area detailed in the activity/lesson.

Vocabulary

Original Source (if applicable)

- Cally Chauvin
- LUCEC

Materials List

- BTNEP Vanishing Wetlands Video: Clip Four
- 1 puzzle per group

Background Information

Subsidence drowns the marsh, causing chemical changes in wetland soils, which eventually kills marsh vegetation. This causes a chain reaction that destroys many of our natural resources.

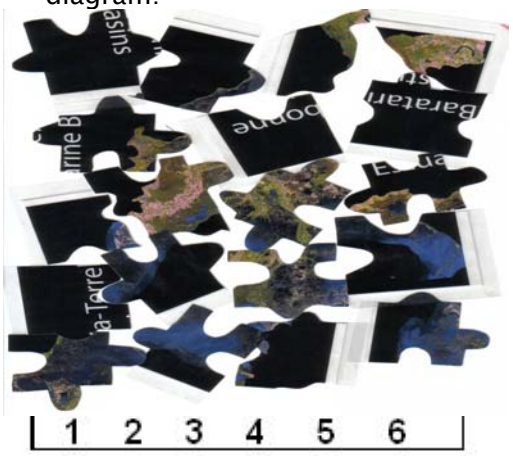
Advance Preparation

- View BTNEP Video Vanishing Wetlands Clip 4
- Puzzles for groups of students

Procedure

1. Show the Clip 4 – Vanishing Wetlands. Give them the definition of subsidence. Ask them to tell you how the video made them feel about subsidence.
2. Tell the students that they will see how surface subsidence happens.
3. Distribute the puzzle to each group.

4. Tell the students to dump out the puzzle pieces into a pile and then lay the entire puzzle pieces touching each other. Use a ruler to measure the width of the area. See diagram:



Envision a family activity such as working on a jigsaw puzzle. When you lay out all the pieces, the puzzle covers a relatively large space.

After being put together (=making the "rough edges" fit closer), the puzzle occupies much less space.

5. The teacher explains the following:

- When soil particles fit closer together, they occupy less space so the surface sinks or subsides.
- When water is removed from soil, the spaces where the water was are now filled with air so the soil particles move closer together and the surface subsides.
- When organic matter (such as leaves, peat, etc.) decomposes, soil subsides as particles move into the spaces where the organic matter was.
- When plants die and their roots decay, soil subsides as the particles move closer together.

Assessment

- Have the students answer in a journal or sheet of loose leaf paper, the following: In your own words describe what subsidence means to you.

Websites/References/Resources:

www.btnep.org
http://www.loyno.edu/~lucec/mrderosion.html#1

Restoration History

In order to understand how Bayou Lafourche received the funds to begin the restoration projects, a little history lesson is in order. Over the past three decades, both Federal and State governments have established policies and programs that are intended to halt and reverse the loss of Louisiana's coastal wetlands and to restore and enhance their functionality. Key initiatives (among others) include: the Federal Coastal Zone Management Act (1972), Louisiana Coastal Wetlands Conservation, Restoration and Management Act (1989), Louisiana Act 6 (1989), Barataria-Terrebonne National Estuary Program (1990), The Gulf of Mexico Program (1991), and Sections 204, 206, and 1135 of the Water Resources Development Acts (of 1986,1992, and 1996). The information obtained in this section was adapted from the LCA Fact Sheet April 2004, Vol.1, Issue1, Evolution of Coastal Restoration in Louisiana.

The passage of the Coastal Wetlands Planning Protection and Restoration Act (CWPPRA) or fondly known as the Breaux Act, provided Federal authorization and funding to address coastal wetland losses in Louisiana and elsewhere in the Nation. CWPPRA specifically created a multi-agency task force tasked to curtail the rapidly mounting wetland losses in Louisiana. The CWPPRA Program, matched with state authorities, has and continues to serve as a vehicle for implementing Federal and State cost-sharing projects that yield restoration benefits at local scales.

The "Coast 2050: Towards a Sustainable Coastal Louisiana report (1998) known as the *Coast 2050 Plan*, was the next step. The Coast 2050 Plan identifies the river diversions, marsh creations, barrier island restoration and protection, and hydrologic restoration as examples of the project types that offer solution that can be applied in a strategic context in each of four regions – collectively consisting of nine distinct hydrologic basins – comprising the Louisiana coastal zone.

State and Federal participants agreed it was imperative to develop one in-depth, comprehensive, equally cost-shared assessment of coastwide restoration in Louisiana. The decision led to the formation of the Louisiana Coastal Area (LCA) Comprehensive Coastwide Ecosystem Restoration Study Team in March 2002.

This multi-agency LCA team worked to submit the next level of analysis and documentation necessary to obtain Federal funding though the 2004 Water Resources Development Act to conduct the coastwide feasibility study.

Louisiana legislators are currently fighting to get Louisiana the aid it needs. Getting actively involved in coastal issues is the best defense we have. Urge your students to write to the newspapers, their legislatures, and even the President of the U.S. asking for help in saving our land and resources.

Different types of Coastal Restoration Projects:

River Diversion	➢ There are two types of river diversions: a) Controlled diversions – where gates or siphons are used to regulate the volume of water flow b) Uncontrolled diversions – where a gap is cut in a river levee and natural land- building processes promote the creation of new marsh in place of open-water areas
Outfall Management	➢ maximize the benefits of a river diversion project. This technique can regulate water levels and direction of water flow ➢ water flow may be regulated by a combination of gates, locks, weirs, canal plugs, & gaps cut in artificial levee banks.
Hydrologic Restoration	➢ involve reverting human-altered drainage patterns toward more natural drainage patterns ➢ large scale may involve locks & gates on major navigational channels ➢ smaller scale may involve blocking dredging canals or cutting gaps in levee banks created by canal dredging
Marsh Management	➢ historically used to manage land for waterfowl & furbearers ➢ involves controlling the water level &/or salinity in an impounded marsh area ➢ a variety of structures may be used
Shoreline Protection	➢ involve techniques designed to decrease or halt shoreline erosion ➢ some rock berms may be applied directly to the eroding shoreline ➢ segmented breakwaters& wave damping fences are placed in adjacent open water to decrease the wave's energy before it hits the shoreline
Barrier Island Restoration	➢ protect and restore the features unique to La.'s barrier island chains ➢ may incorporate the placement of dredged material to increase island height and width ➢ placement of structures to protect the island from erosive forces ➢ placement of sand-trapping fences used in conjunction with vegetation planting
Dredged Material/ Marsh Creation	➢ involve the beneficial use of sediment frequently dredged for maintenance of navigation channels & access canals ➢ material is placed in deteriorated wetland at specific elevations so that desired marsh plants will colonize & grow

Sediment and Nutrient Trapping	➢ involve structures that are designed to slow water flow & promote the buildup of sediment ➢ examples include brush fences (Christmas Tree Project) & shallow bay terraces
Vegetation Planting	➢ used both alone & in conjunction with shoreline protection, barrier island restoration, marsh creation, & sediment & nutrient trapping restoration techniques ➢ involve the use of flood-tolerant marsh plants that will hold sediments together and stabilize the soil with their roots
Demonstration Projects	➢ small-scale, short-term projects ➢ allows CRD (Coastal Restoration Department) & others to evaluate new restoration techniques ➢ provide useful information for the design of future large-scale projects

See examples of each restoration project at http://www.savelawetlands.org/site/alphabet.html.

Restoration Programs in Lafourche Parish

There are several restoration projects that are in effect in Lafourche Parish.

State	CWPPRA	Project Name
BA-01		Davis Pond http://www.mvn.usace.army.mil/pao/dpond/davispond.htm
BA-02	BA-02	GIWW (Gulf Intercoastal Waterway) to Clovelly Hydrologic Restoration
BA-18	BA-18	Fourchon
BA-22	PBA-34	Bayou L'Ours Ridge Hydrologic Restoration
BA-27 -a	XBA-63	Barataria Basin Land Bridge Shoreline Protection, Phase 2, Increment 1
BA-27-b	XBA-63ii A	Barataria Basin Land Bridge
LA-01		DNR Dedicated Dredging Program
TE-10	XTE-49	Grand Bayou / GIWW Freshwater Introduction
TE-23	PTE-27	West Belle Pass Headland Restoration
TE-25	XTE-67	East Timbalier Island Sediment Restoration #1
TE-30	XTE-45/67b	East Timbalier Island Sediment Restoration #2

"One who knows the Mississippi will promptly aver...that ten thousand River Commissions, with the mind of the world at their back, cannot tame the lawless stream, cannot curb it or confine it, cannot say to it Go here or Go there, and make it obey; cannot save a shore that it has sentenced."

Mark Twain
Life on the Mississippi

A Quote From Mark Twain

BTNEP Connection
Hydrological Modification

Grade Level
7

Duration
20minutes

Subject Area
History, Science, Language Arts,

Extension Areas
Use a book of quotes from the library; see if your students can find any more quotes that can be applied to a situation in Louisiana.

Vocabulary
- Interpretation
- Hydrological modifications

Original Source (if applicable)
Cally Chauvin
Mark Twain quote

Focus/Overview

Interpreting a quote. This quote can be interpreted in many ways. The students can justify their responses to what is happening today in Louisiana.

Learning Objective(s)

The learner will:

- interpret a quote from Mark Twain
- identify pros and cons of human technological activities upon Louisiana

Louisiana Grade Level Expectations

7-GLE-H-44	Explain the point of view of key historical figures in U.S. history (H-1A-M1)
7-GLE-H-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)
7-GLE-SE-39	Analyze the consequences of human activities on ecosystems (SE-M-A4)
7-GLE-SE-43	Identify & analyze the environmental impact of humans' use of technology (SE-M-A8)
7-GLE-ELA-3	Interpret literary devices (ELA-1-M2)

Materials List

- copy of quote
- Give notes on Restoration efforts and waterway areas of coastal Louisiana

Background Information

Mark Twain, aka Samuel Clemens, is a famous author who actually experienced first hand how powerful the Mississippi River is. He had to maneuver a large steamboat up and down, twisting and turning his way through the sometimes-turbulent waters of the River. His stories are based on many of his adventures. His quote brings home the plaguing issues facing the Louisiana coast.

Advance Preparation

- PowerPoint slide or transparency showing the quote by Mark Twain

- Notes on Restoration efforts and waterway areas of coastal Louisiana

Procedure

1. Display the quote
2. Have the students write what they think Mark Twain is saying in the quote
3. Have them show how this quote applies to Louisiana
4. Go over the section on Restoration
5. Have students explain how technological developments have changed the land and water areas of Louisiana (Pros and Cons)
6. Have the students research how all of these changes due to human activities have had negative impacts on the ecosystems of Louisiana
7. Have them write a poem on one or more of the issues that they learned about

Blackline Master(s)

1. See quote
2. See Pros and Cons Sheet

Assessment

Language Arts & History:

The learner will create a poem on the issues facing Louisiana.

Tradebooks:

Huck Finn
Survival! Flood by K. Duey and K.A. Bale

References:

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"One who knows the Mississippi will promptly aver...that ten thousand River Commissions, with the mind of the world at their back, cannot tame the lawless stream, cannot curb it or confine it, cannot say to it Go here or Go there, and make it obey; cannot save a shore that it has sentenced."

Mark Twain
Life on the Mississippi

Pros and Cons

of technological development that have changed the land and water areas of Louisiana

Technological Development	PROS 	CONS 
Man-made Canals		
Man-made Levees		
Hydrological Modifications		
Pipeline Surrey		

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