



Habitat

Activity 1-4

Wetland in a Pan

Focus/Overview

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

Learning Objectives

The learner will...

- describe the importance of wetlands in flood control.
- appreciate the ability of wetlands to filter sediment and other pollutants.
- describe how wetlands help to control shoreline erosion.

Louisiana Grade Level Expectations

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

Background Information

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

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

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

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

BTNEP Connection

Habitat

Grade Level

3, 4

Duration

Two or three 45-minute class periods

Subject Area

science

Setting

classroom or outdoors

Extension Areas

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

Vocabulary

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



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

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

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

Activity 1. Wetlands in a Pan (Teacher Demonstration)

Materials List

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

Advance Preparation

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

Procedure

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

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

Materials List

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

Advance Preparation

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

Procedure

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

Blackline Masters

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

Assessment

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

Extensions

Language Arts:

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

Social Studies:

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

Math:

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

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

The Arts:

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

Science:

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

Resources

BTNEP Resources:

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

Tradebooks:

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

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

Galko, Francine. 2002. **Wetland Animals**. Heinemann Library.

Describes wetlands, the different kinds of animals that can be found in them, and their ecological importance. Reading level: Ages 4-8.

Kalman, Bobby. 2002. **What are Wetlands?** Crabtree Publishing.

Investigates some types of wetlands, including swamps, salt marshes, bogs, and flood plains; the many plants and animals that live in wetlands; and the threats to these ecosystems. Reading level: Ages 4-8.

Keller, Holly. 1994. **Grandfather's Dream**. Greenwillow.

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

McLeish, Ewan. 1995. **Wetlands (Habitats)**. Thompson Learning.

A geography book on the world's wetlands showing how they are formed, why they are important, and what can be done to safeguard them for the future. Reading level: Ages 9-12.

Posters:

U.S. Fish and Wildlife Service. 2003. **Working Together: Partnerships for Endangered Species Recovery poster.**

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

Websites:

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

References:

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

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

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

Wetland in a Pan Script

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

UNDERSTANDING PARTS OF THE MODEL

→ SHOW PREPARED MODEL.

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

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

WETLANDS FUNCTION: FLOOD CONTROL

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

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

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

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

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

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

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

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

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

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

WETLANDS FUNCTION: POLLUTION, SEDIMENT AND NUTRIENT REDUCTION

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

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

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

Was your prediction correct?

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

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

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

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

WETLANDS FUNCTION: STORM WAVE BUFFER and EROSION CONTROL

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

Blackline Master #1 – pg 2

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

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

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

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

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

WETLANDS FUNCTION: HABITAT FOR WILDLIFE

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

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

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

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

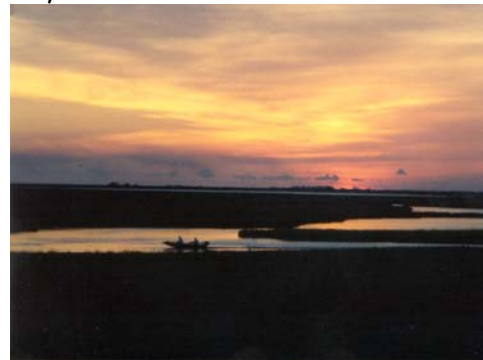
Why do you think these animals and plants are on the list?

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

Wetland Ecosystem in a Pan Instructions

Make your wetland model.

1. To create land, spread the modeling clay over one-half of the pan, letting it gently slope toward the center of the pan. Smooth the clay at the edges of the pan to seal.
2. Select a piece of carpeting, foam, or sponge to represent the wetlands. It should fit about one-half of the rest of the pan. Try to get as tight a fit as possible, with a smooth transition from dry land to wetland.
3. Use construction paper or modeling clay to represent the ocean or Gulf of Mexico.
4. Add wetland animals and plants to your wetland ecosystem.
 - For animals: Make paper cut-out animals and color them with markers. Or perhaps you would like to make clay or Play Dough models. You can also look through old magazines to find pictures of animals that might live in Louisiana wetlands. You can carefully cut these pictures out of the magazine (get permission from your teacher or parents first!) and then glue it to some construction paper. You can trim the construction paper and then tape your animal to a toothpick and stick the end of the toothpick in the clay to stand the model up.
 - For plants: here are some fun suggestions for some wetland plant species.
 - cattails - use cotton swabs, painted brown and green
 - rushes - use pine needles
 - spartina - use a narrow-leaf lawn grass like crab grass or Bermuda
 - cypress trees - a twig draped with a little Spanish moss
5. Choose at least two threatened or endangered animals or plants in Louisiana that lives in a wetland ecosystem to include in your Wetland Ecosystem in a Box. Be sure that they can be found in the coastal wetland ecosystem you are constructing.
 - Find a picture of the animal or plant (visit the U.S. Fish and Wildlife Service's website [<http://endangered.fws.gov/wildlife.html>] to find out more information about your two animals or plants. Scroll to the bottom of the page and click on the appropriate animal group (mammal, bird, etc.) Then look for the species you have chosen. Click on the scientific name and it will take you to a page full of information, pictures and videos about the species you have selected.
 - Prepare a one page report about each of your two species. Give a description of your species and include a picture if you can find one. Tell why your species is threatened or endangered. Tell what part of Louisiana (parish) your species lives in and what habitat or ecosystem they are part of.



Sunset over a south Louisiana marsh.

Endangered and Threatened Animals and Plants of Louisiana



Status	Animal (24 species)	Group (Habitat)
E	Crane, Whooping (<i>Grus americana</i>)	bird (salt marsh and coastal prairie)
E	Curlew, Eskimo (<i>Numenius borealis</i>)	bird (migratory bird)
E	Eagle, bald (lower 48 States) (<i>Haliaeetus leucocephalus</i>)	bird (quiet coastal areas, rivers or lakeshores with large, tall trees)
E	Pelican, brown (except U.S. Atlantic coast, FL, AL) (<i>Pelecanus occidentalis</i>)	bird (shallow estuary waters and coastal wetlands)
E	Prairie Chicken, Attwater's Greater (<i>Tympanuchus cupido attwateri</i>)	bird (tall grass coastal prairies)
E	Tern, least (interior population) (<i>Sterna antillarum athalassos</i>)	bird (coastal wetlands and beaches)
E	Warbler, Backman's (<i>Vermivora bachmanii</i>)	bird (low, wet forested wetlands)
E	Woodpecker, ivory-billed (<i>Campephilus principalis</i>)	bird (upland forests)
E	Woodpecker, red-cockaded (<i>Picoides borealis</i>)	bird (old growth pine forests)
T	Heelsplitter, Alabama or "inflated" (<i>Potamilus inflatus</i>)	clam (freshwater streams in eastern Louisiana)
E	Mucket, pink or pearlymussel (<i>Lampsilis abrupta</i>)	clam (upper Mississippi River)
T	Pearlshell, Louisiana (<i>Margaritifera hembeli</i>)	clam (freshwater streams in central Louisiana)
T	Sturgeon, Gulf (<i>Acipenser oxyrinchus desotoi</i>)	fish (Gulf of Mexico)
E	Sturgeon, pallid (<i>Scaphirhynchus albus</i>)	fish (Gulf of Mexico)
E	Beetle, American burying (giant carrion, <i>Nicrophorus americanus</i>)	insect (undisturbed areas)
T	Bear, Louisiana black (<i>Ursus americanus luteolus</i>)	mammal (bottomland hardwood forests)
E	Manatee, West Indian (<i>Trichechus manatus</i>)	mammal (shallow salt and freshwater; estuaries)
E	Panther, Florida (<i>Felis concolor coryi</i>)	mammal (upland forests and wetlands)
T	Sea turtle, green (except where endangered) (<i>Chelonia mydas</i>)	reptile (Gulf of Mexico)
E	Sea turtle, hawksbill (<i>Eretmochelys imbricata</i>)	reptile (Gulf of Mexico)
E	Sea turtle, Kemp's ridley (<i>Lepidochelys kempii</i>)	reptile (Gulf of Mexico)
E	Sea turtle, leatherback (<i>Dermochelys coriacea</i>)	reptile (Gulf of Mexico)
T	Sea turtle, loggerhead (<i>Caretta caretta</i>)	reptile (Gulf of Mexico)
T	Tortoise, gopher (W of Mobile/Tombigbee Rs.) (<i>Gopherus polyphemus</i>)	reptile (well-drained sandy soils; pine forest)
T	Turtle, ringed map (<i>Graptemys oculifera</i>)	reptile (wide rivers)
E	Whale, sperm (<i>Physeter macrocephalus</i>)	mammal (Gulf of Mexico)
E	Whale, sei (<i>Balaenoptera borealis</i>)	mammal (Gulf of Mexico)
E	Whale, blue (<i>Balaenoptera musculus</i>)	mammal (Gulf of Mexico)
E	Whale, finback (<i>balaenoptera physalus</i>)	mammal (Gulf of Mexico)
Status	Plants (4 species)	Group (Habitat)
E	Quillwort, Louisiana (<i>Isoetes louisianensis</i>)	fern (sand and gravel bars in rivers)
T	<i>Geocarpon minimum</i> (No common name)	flowering plant (most sandy soil; north LA)
E	Pondberry (<i>Lindera melissifolia</i>)	flowering plant (coastal wetlands & ponds)
E	Chaffseed, American (<i>Schwalbea americana</i>)	flowering plant (open sandy soils of moist pine flatwoods)

E= Endangered T = Threatened

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