Chapter 3

Essential Questions:

What is an estuary?

What do estuaries do for me?

What can we do to protect the Lake Pontchartrain Estuary?
THE MAGIC OF THE ESTUARY

“If there is magic on this planet, it is contained in water.”

Loren Eiseley
Immense Journey

OBJECTIVES:

• Define an estuary.

• Describe characteristics of an estuary.

• List the functions of an estuary.

• Visit an estuary, making a permanent record with a photo or nature journal.

• Participate in creative problem solving, brainstorming problems and solutions, and developing criteria to solve a given problem.

MULTIPLE INTELLIGENCES LEARNING ACTIVITIES:

Verbal/Linguistic: Describe and tell stories about estuary photos. Develop a script for a news program.

Visual/Spatial: Photograph estuary areas and organize them into a photo journal or visual presentation.

Musical: Listen to sounds of the estuary and substitute nature sounds for words of familiar songs, performing original musical pieces.

Intrapersonal: Write personal feelings about the estuary photos.

Interpersonal: Investigate a scenario; identify problems; select a specific problem; brainstorm solutions; select possible solutions to the problem using acceptable criteria.

Naturalist: Observe and investigate the physical, behavioral and physiological adaptations possessed by estuarine organisms.
THE BASIN BLUES

Shhhh! Buzz, buzz, shhhh! Slap, slap, crunch, crack, yipes! Hum, hum, sputter, splash, splat! Buzz, buzz, humm!

There’s a place where critters abound, where water is deep and rich, where animals munch on grassy green stalks, and then take the time for a dip....

There’s a place, where grasshoppers go, where nutria travel and trail, where birds of all kinds of feathers will flock together, and fish look fishy-eyed at the world!

There’s a place where a crab is a king, and a snail like a jewel will sway, there’s a place where fisher people will go and will stay all night and all day!

There’s a place where the sun and energy it brings shines from daylight to dusk, then a silvery white moon will sparkle the night and the sounds, whooo, whaaaaa, kurplunk, swish and glop, will make all of us stop!

WHAT IS AN ESTUARY?

An estuary is:

a semi-enclosed body of water that has a free connection with the open sea and within which the sea water is measurably diluted with fresh water that is derived from land drainage.
Estuary Characteristics

THE ESTUARY

has
SALINITY
ranges from
0-35 ppt

receives
FRESH WATER
from
land drainage
to
creeks
to
rivers
or to
bayous
has
TIDAL INFLUENCE
from
OCEAN
moves
nutrients
& wastes
Salinity:

- An estuary is a place where sea water is measurably diluted by fresh water from land drainage.
- The mixture of fresh and salt water provides a variety of habitats for animals and plants in the area.
- Salinity is a measurable quantity:
  - Fresh water is described as having 0-0.5 ppt (parts per thousand) of salt dissolved in the water.
  - Sea water is 20-35 parts per thousand. Imagine if you took 35 grams or parts of salt (table salt will do!) and dissolve it in 1,000 parts of water...you have just made sea water!

Fresh water:

- There are areas of the estuary which are characteristically freshwater areas. Other areas of the estuary, however, will have varying degrees of salinity because of the introduction of saline water from the Gulf of Mexico.
- Fresh water in the estuary comes from rivers, creeks, bayous, and streams which drain toward the estuary.
- Fresh water amounts will vary with variations in rainfall.
- During periods of heavy rainfall the estuary becomes less salty since more fresh water is added.
- Animals living in the estuary must tolerate wide ranges of salinity and, therefore, are called euryhaline biota. If you travel from the top of the estuary toward the Gulf of Mexico, salinity as well as types of animals and plants will change.

Tidal Influence:

- The salinity of an estuary may change on a daily basis due to tides and winds.
  - **Tides** are the daily or twice daily movement of water in and out of an estuary or coastal area. There are high and low tides. High tides are determined by the high water mark on the shoreface, the sand on the beach. High tides bring high salinity water and add nutrients to the estuary, flushing away waste products, impurities, or even pollution. As the high tide gradually falls to its lowest point, it becomes the low tide, and the cycle starts over again.
  - **Winds** are movements of air which blow from offshore, moving seawater into the estuary. Winds also blow from the land toward the sea, moving water out of the estuary and drying areas which are normally wet.
Biodiversity:

When an ecosystem or a habitat has many different plants and animals, it exhibits **biodiversity**. Biodiversity contributes to the stability of ecosystems. If there are many producers, consumers and decomposers, there is less chance that loss of one species will impact the entire ecosystem.

Estuarine animals and plants must tolerate changing salinities and other conditions such as fluctuating temperature, water level, currents, and levels of oxygen. These changing conditions are stressful to many animals and plants. Few species can tolerate these conditions. Therefore, the ecosystem is less diverse! For example, while we may have many species of fish in some estuarine areas, scientists tell us that a coral reef contains four times as many species as are found in Lake Pontchartrain, a typical estuary.

What the estuary lacks in **biodiversity**, it makes up for in **abundance** of the species that inhabit the area. To a mosquito this means that there is a lot of grass from which it can suck plant juices; to a frog, it means there are a lot of mosquitoes to catch at night; to a blue heron, it means there are a lot of frogs to catch!

Muddy Substrates:

- Sediments such as sands, silts, and clays are found in estuaries and are derived from river systems.
- The specialized environment of muddy substrates is home for burrowing worms, clams, microscopic bacteria, fungi, and other specially adapted animals.
- If you plan on living in the estuary, prepare to get your feet muddy!
Functions of the Estuary

THE ESTUARY

is a NURSERY
that offers protection
from predators such as BULLSHARKS
and provides food in the form of DETRITUS

is used for FISHERIES & RECREATION
such as shrimping, fishing, and boating

is a HABITAT
that has muddy substrate
for plants & animals such as ALLIGATORS and BULLRUSHES
and exhibits biodiversity
Habitat:

The estuary is home to many species of plants and animals. As a home it provides protection, food, and space in which animals and plants find similar members of their own species.

Animals in the estuary may be well suited to:

- living on tall grass, like the periwinkle snail that lives on Spartina alterniflora;
- burrowing in the muddy substrates, such as Rangia cuneata clams and marine worms;
- hiding under rotting vegetation as crawfish do, or
- clinging among the stalks of Spartina alterniflora like grass shrimp.

Nursery Area:

Many species, such as the shrimp and menhaden (pogie), use estuarine areas to nurture and protect their young.

Larval shrimp and juvenile menhaden move into the estuary where they grow to maturity because:

- there is an abundance of food, and
- the estuary is shallow, protecting juveniles from predators.

Submersed aquatic vegetation, such as Vallisneria americana (water celery), provide beds of vegetation for young animals to find protection.

Life Cycle of the Shrimp

Seasonally adults in open ocean produce eggs and sperm which unite to form larvae which grow into juveniles in the estuary and finally a mysis larvae which mature as adult shrimp.
Fishery and Recreation:

Fisheries such as shrimp, crab, mullet and oyster depend on high productivity of the estuarine areas.

Many people, such as commercial fishers, use estuaries for their livelihood.

An example is the crab fisher.
- Crab fishers put out crab traps in shallow bays and inlets.
- These baited traps “catch” blue crabs in a baited wire cage from which they cannot escape.
- Crab fishers harvest only crabs of a certain size; this assures that there are enough adults left to reproduce the following year.
- The crab fishery is economically important in the Lake Pontchartrain Estuary because fishers depend on the crab harvest for their livelihood.

The estuary with its high productivity is a place where boating, sailing, recreational fishing, shrimping, and crabbing activities take place. In this diverse habitat, many people enjoy the relaxing atmosphere and derive pleasure from these leisure activities.

What a wonderful area to enjoy!

THE LAKE PONTCHARTRAIN ESTUARY

Lake Pontchartrain is a 630 square mile estuary which receives fresh water from six major sources:

1. Tangipahoa River
2. Tchefuncte River
3. Tickfaw River
4. Amite River
5. Bogue Falaya River
6. Bayou Lacombe

SALINITY:

The Lake Pontchartrain Estuary receives salt water from the Gulf of Mexico, entering Lake Pontchartrain through the Rigolets and Chef Menteur Passes. A smaller lake, Lake Maurepas, is connected to Lake Pontchartrain at its western edge by Pass Manchac. Its contribution of fresh water serves to dilute lake salinity.
Salinity in the estuary ranges from 0.5-15 ppt. The highest salinities are found near the Rigolets and Chef Menteur Passes as high salinity water is pushed from the Passes into Lake Pontchartrain.

An additional source of high saline water is the Inner Harbor Navigation Canal on the south shore of Lake Pontchartrain. This water is channeled through the Mississippi River Gulf Outlet and is largely responsible for changing freshwater habitat areas in the lower Mississippi River Delta to saltwater areas.

**FRESH WATER:**

The fresh water from six major sources measurably dilutes high saline waters. For example, salinities near the Tangipahoa River are close to 0 ppt.

Under certain flooding conditions in the Mississippi River, the Bonnet Carré Spillway is opened and provides additional fresh water to the estuary.

The quality of water entering the estuary from the rivers, bayou and spillway is of concern to those who use the estuary. This water quality may be contaminated by:

- Urban runoff: oil from city streets or untreated sewage;
- Agricultural wastes: manure from dairy feed lots;
- Chemical Pollution: toxins released into the river;
- Sediment: from poor soil conservation practices;
- Excess nutrients: fecal material and fertilizer from farms along the Mississippi;
- Litter or garbage: waste from careless boaters or recreational users.

**TIDAL INFLUENCE:**

Tides in Lake Pontchartrain are produced by winds.

These tides are minimal, and the tidal range is three to ten inches under most conditions. The winds also drive a counterclockwise current in Lake Pontchartrain, causing water to circulate in that pattern. This means that what gets into Lake Pontchartrain usually stays there!

**ESTUARINE WETLANDS:**

Historically, the land surrounding the Lake Pontchartrain Estuary contained acres and acres of wetlands such as marshes, swamps and bottomland hardwood forests. This huge brackish-water (0.5-15 ppt salinity) estuary and its surrounding wetlands functioned as diverse habitat for freshwater and marine species.

These wetland areas acted as filters for water entering the Lake from land drainage; therefore, water in Lake Pontchartrain remained clean and useable.

**Today, many of the wetland areas have disappeared:**

- affecting water quality in Lake Pontchartrain and
- causing loss of habitat for many species which surround the Lake.
Although there are many habitats in the Lake Pontchartrain Basin, we will focus on the surrounding wetlands and the Lake bottom.

**Wetlands:**
The healthy vegetated wetlands surrounding the Lake provide protection and food for many estuarine animals such as:

- **Mammals:** raccoons, opossums, squirrels, deer;
- **Reptiles and Amphibians:** yellow-bellied water snakes, red-eared slider turtles;
- **Birds:** American egrets, red-winged blackbirds, little blue herons, American bald eagles;
- **Invertebrates:** blue crabs, crawfish, shrimp, oysters;
- **Fish:** juvenile menhaden (pogie), least killifish, speckled trout, red snapper.

**Lake bottom or benthic substrate of Lake Pontchartrain:**
The silty bottom of this large lake is habitat for many invertebrate animals. Among them is the *Rangia cuneata* clam:

- Rangia was a favorite food of local Native American inhabitants.
- When purged of silt and fried in a batter, these clams are quite delicious!
- The shells of the dead clams were used to make roadbeds throughout the country. Economically the shells were valuable, and an industry which dredged up living and dead clam shells developed.
- Since shell dredging which increased lake turbidity was halted ten years ago, the turbidity in the Lake is clearing. Along the edges of the Lake, where sandy bottom sediment is found, favorable conditions are supporting the growth of submersed aquatic vegetation (SAV). The vegetation is *Vallisneria americana* or water celery. It is important because:
  - **Submersed aquatic vegetation, or grass-like plants which grow under water, are returning with the decrease in turbidity.**
  - **Submersed aquatics are home for many species, like blue crabs and juvenile fish species.**
  - **Submersed aquatics provide oxygen and are a source of food for some species in Lake Pontchartrain.**
  - **Submersed aquatics are part of a healthy ecosystem and indicate that Lake Pontchartrain is beginning its recovery from environmental problems.**
ACTIVITY:
Music of the Estuary

Materials:
- Rattles
- Sticks
- Whistles
- Duck calls
- Water pipes
- Drums
- Bottles filled with water
- Any object that can be used to make sounds
- Environmental tapes: Sound of the Everglades, Rainforest, Sounds of the Ocean

Process:

1. Play a commercial tape of environmental sounds or students can make their own tapes while visiting a wetland area.

2. Ask students to brainstorm a list of different ways to simulate the sounds of nature using objects or their own voices.

3. Suggest that students simulate background noises of the estuary, including grasses blowing in the wind, a frog plopping into a pond, a seed pod rattling in the wind, a branch falling, or an owl hooting.

4. Ask each student to concentrate on one sound and form a class Estuary Orchestra! Write a musical score putting sounds to songs such as “Old MacDonald Had a Farm”, “The Blue Danube”, “Twinkle, Twinkle Little Star”. Students may want to have several tape recorders available to tape and play back their particular sound.

5. Perform the Estuary Symphony!

Example: “Old MacDonald Had a Farm...e-i-e-i-o!”
(simulate background noises such as a baby alligator, crickets, mosquitos, and various birds)

The old bass fisherman had a place, e-i-e-i-o!
And in this place there was a frog, e-i-e-i-o!
With a rribbit rribbit here and a rribbit rribbit there, here a plop, there a plop, everywhere a plop, plop!

The old bass fisherman had a place, e-i-e-i-o!
And in this place there was a bird, e-i-e-i-o!
And this ole bird spied a real green frog, e-i-e-i-o!
With an eek eek here and an eek eek there, here an eek, there an eek, everywhere an eek, eek,
The old bass fisherman had a place, e-i-e-i-o!
Questions:

❶ What part does sound play in the lives of animals?

❷ Which sounds are most appealing to you?

❸ Which sounds of nature are the easiest to simulate?

❹ If you had to use an environmental sound to communicate all of the time, which one would you choose? Why?

Extensions:
1. Perform the symphony at a parent-teacher night.
2. Take the Estuary Symphony to a classroom in the lower grades and teach the students about the estuary; performing the symphony with them!
3. Using the poem The Basin Blues, (Page 58), have students put natural rhythmic sounds together with the words. Produce sounds from sticks, seed pods, gourds, grasses or branches of tree leaves.

ACTIVITY: Magical Images of the Estuary

The estuary is truly a magical place.
Bring the magic to life by capturing it with a magic “eye”!

Materials:
- Polaroid cameras
- Film
- “Magical Images of the Estuary” handout, page 70.

Process:
1. Choose a local wetland area to visit.
2. Distribute copies of the “Magical Images of the Estuary” handout.
3. Brainstorm a list of picture-taking hints with your students.  
   **Examples include:**
   - Always take pictures with the light behind you; do not face the sun!
   - Choose a center of interest for the picture.
   - Look for interesting textures, lines, color and form.
   - Try getting real close! (Use common sense with animals.)
   - Show the size and scale of an object by placing a common object that everyone can identify (such as a coin) in the photo composition.

4. Discuss with students possible subjects for their photo journals or photo essays.  
   **Examples include:**
   - Animals, birds, or grasses and plants in the estuary;
   - Producers, consumers, and decomposers in the food chain;
   - Elements of the water cycle, and
   - A “tour” through the estuary!

5. Design a book of estuary photos using a specific theme with text blocks identifying, describing, and telling stories about the pictures.

6. Have an exhibit of all photo journals and photo essays!

**Extension:**
Exhibit photo journal and photo essays at a school function or in an elementary school classroom.
### Magical Images of the Estuary

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ACTIVITY:  
Estuary Interviews

Capture moments in time, moments in the lives of estuary animals. Much like a photo, a news interview can probe, illuminate, and clarify interesting facts about the inhabitants of the estuary.

Materials:
- Costumes for role playing
- Hats

Process:
1. Show a video of a local news program demonstrating different interview formats, sets, and techniques.
2. Ask students to design a news program about the lives and habitats of selected estuary animals.
3. Research the lives of selected animals found in the wetland areas. Information may be found in local environmental publications such as Louisiana Conservationist magazine or regional and national publications.
4. Develop a script for the news program around a current theme in estuaries such as pollution, loss of wetland areas, development of wetlands, or fishing rights and regulations.
5. Rehearse the news program, using costumes and commercials relevant to the estuary, its animals, and plants.
6. Use pictures and slides from the Magic of the Estuary activity. Colorful pictures from environmental magazines may also enhance the presentation.
7. Videotape the broadcast. Play the video tape for the parent organization at school, a class of elementary students, or as a special event for Earth Day or Beach Sweep!
ACTIVITY:

Estuary Issues

Estuaries, like any wetlands, are controversial. The controversy arises when people have divergent viewpoints over the use of these areas. As the population grows toward coastal regions, coastal wetlands and estuaries are changed to provide needed facilities. This may become a problem in areas where wetland use is not agreed upon by the community. Each of us, once recognizing a problem exists, must take a stand!

The following is a scenario which contains several points of controversy. By identifying the problems and working toward mutually beneficial solutions, people on different sides of the issue feel validated and satisfied.

SCENARIO:

Fishing Rodeo

A red and blue banner hung across the entrance to the park “Fishing Rodeo Today.” Hannah flipped her baseball cap around to get a better view of the competition. Yes, Jamal and Roberto had shown up, but so had Darryl, Brandon, and Mai Ling. All of the most avid fishers in the sixth grade had plopped down $3.00 each to compete in “The Biggest Fish Caught” event at the park near the shore of Lake Pontchartrain.

The sun was just peaking through the clouds while various bait was being passed around. Hannah brought her special bait: a new shiny hook, shrimp aged just so, and a container of fresh worms, just in case. Hannah loved to fish. She had a trophy from the same rodeo, winning either the biggest or the smallest fish in her age class. Almost everyone got some kind of prize. The local Saltwater Fishing Club sponsored the annual event.

As the morning lengthened, the sixth grade group grew discouraged. Not only Hannah, but Jamal and Roberto and all of the others were unable to catch a fish, any fish! The members of the fishing club murmured, “No good fishing today. Fishing’s been poor since the new subdivision was built.” Hannah looked closely at the water. The water which was once moderately clear lake water was now milky with sediment washed from the graded new lots. Algae, green and stringy, was clinging to the rip rap and logs in the water. As she walked she noticed paint cans, rags, bits of insulation, tar and cans of wood preservative dotted the shore. Why was this development so important?

Hannah ran back to join her sixth grade friends. Their discouraged faces greeted her. Roberto called, “Hey, Hannah, where ya been?” Hannah echoed back, “Down to see the edge of the development!” Jamal said, “That’s where my Dad works, Hannah!” Hannah exclaimed, “Your Dad works at the new development. You should see the mess there, and I’ll bet all of that has something to do with not being able to catch fish!”
Hannah, Jamal, Roberto, Darryl, Mai Ling and Brandon all started talking at once. They remembered their teacher, Ms. Morrison, telling them about how jobs in the area were important and how wetlands (the lands adjacent to waterbodies, which are wet during certain times of the year) are important to fisheries such as crabs, oysters, juvenile fish and other species. Mr. Martin, president of the Fishing Club, saw the animated group and came over to join them. He explained that the shore of the Lake has changed over the last few years due to the demand for land for development and that local environmentalists in the region suspected it had an impact on fishing in the area. “Yet,” said Mr. Martin, “all communities need businesses and industry because of the jobs they provide.”

After a day in the sun with her friends, Hannah gathered her special fishing gear and walked under the shady oaks toward home. A fancy sign from the development site caught her eye, “A Special Home Can Be Yours”... but not for the fish!, thought Hannah.
ACTIVITY: Creative Problem Solving

Materials:
- Fishing Rodeo scenario, (Pages 72-73)
- Creative Problem Solving Worksheets, (Pages 76-77)

Process:

1. Have students read the “Fishing Rodeo” scenario.

2. In order to fully comprehend the problems involved in the scenario, students will need to investigate the situation further. Gather information about development companies, tourism in coastal areas, and revenues brought in by the purchase of fishing licenses. Guest speakers and field trips should also be valuable. Students might interview residents of communities bordering on lakes or other water bodies and gather information about lifestyles and concerns.

3. Have the class brainstorm problems related to the scenario such as land use and development, fishing rights, recreation, and the estuarine ecosystem. Accept all suggestions without criticism.

4. After the brainstorming session, select one problem. In stating the problem:
   - Use guidelines in writing the problem:
     How might we...
     In what ways might we.....
   - Use a descriptive main verb in the active voice.
   - Include qualifying statements such as why, who, or under what conditions.
   - Use a positive approach with a minimum of words.
     An example in the scenario above might be: “How might development companies build without harming the estuarine environment?” or “In what ways might Hannah and her friends investigate the effects of development on animals and plants in the Lake?”

5. Brainstorm the possible solutions to the stated problem. Welcome all ideas during this session. Attempt to fill in information by supplying the answer to questions such as who, what, when, where, why and how? Using these questions develop positive proposals for the solution presented.
Once these proposals have been formulated, it is important to reexamine the problems as well as the solutions. This may be done with the use of criteria. Brainstorm criteria for solutions to the problem. Examples of criteria questions include:

- Which solution will impact the environment least?
- Which solution is most cost effective?
- Which solution will be best for the community?
- Which solution will provide jobs?
- Which solution will be easily accepted by the community?
- Which solution will take the longest time to implement?
- Which solution is most equitable?
- Which solution is most ethical?
- Which solution will enhance the environment?
- Which solution will have an impact on the fewest people?
- Which solution might have an impact on the future?
- Which solution will be most visibly successful?
- Which solution will change attitudes in the community?
- Which solution has the potential to do the most harm?

Discuss the list of criteria and choose five which will be used to consider the solutions to the problem.

Discuss and select five solutions that have the potential to solve the problem. Use the ranking system suggested in the worksheet (Page 77, Section V) to rank each solution. Total up the points given to each solution. The solution with the highest total points appears to be the best solution to the problem based on the criteria developed.
CREATIVE PROBLEM SOLVING WORKSHEET

PROBLEM SOLVING PROCESS:

I. List below what you think the biggest problems are:

II. Select one of these problems and reword it for a creative attack. “How might we...?” “In what ways may we....?” Write your response below:

III. Brainstorm possible solutions to the problem as stated for creative attack.
IV. Develop criteria to evaluate these ideas.

1. 
2. 
3. 
4. 
5. 

V. Select your most promising solutions and evaluate them using the five criteria listed above. Rank each solution from 10 (best) to 1 (poor).

VI. Describe your plan for carrying out the solution you have chosen. What would you have to do in order to put your solution into practice?
Objectives:

1. Research the physical, behavioral and physiological adaptations of estuarine organisms.
2. Visit a nature center, museum, or the New Orleans Aquarium of the Americas to observe estuarine organisms.
3. Set up a simple aquarium in the classroom to facilitate observation of small estuarine organisms.

Teaching Materials:

- Library access
- Internet access
- Books about estuaries and estuarine habitats and organisms
- Ten gallon or larger aquarium
- Aquarium aeration and filtration equipment
- Copies of the handout “Choose an Inhabitant” (Page 80)
- Copies of the handout “What Makes Me So Special?” (Page 81)

Getting Ready:

1. Collect estuarine organisms to inhabit a classroom aquarium. This collection could be part of a class field trip, or the teacher may want to do this alone. The organisms should be small. They may include grass shrimp, small crabs, small minnows, etc. (Crabs are ferocious predators, so keep them separate from organisms you want to protect.)
2. Collect aquatic plants growing in the area.
3. Bring enough water from the collection site to fill your aquarium. (Remember that the water will have a salt concentration particular to the collection site.)
4. Set up the aquarium in the classroom. Include plants and animals.
5. Arrange a field trip to the Audubon Louisiana Nature Center, Aquarium of the Americas, or a local museum with an aquarium. Discuss the activity with staff at the facility prior to the trip. Also contact the Lake Pontchartrain Basin Foundation; they may offer a program that fits your needs.
6. Collect books and magazine articles about estuarine organisms.
7. Research relevant web sites and contact the Lake Pontchartrain Basin Foundation for their publication, A Guide to the Wetlands of the Lake Pontchartrain Basin.
Procedure:

1. Work as a team or individually to conduct your research.

2. Choose a plant and animal organism listed in the handout “Choose an Inhabitant.” Use books and the Internet to conduct research about the physical, physiological, and behavioral adaptations of your chosen organisms.

3. Answer the questions listed in the handout about your chosen organisms.

4. Complete the handout “What Makes Me So Special?”

5. Create a profile of your chosen organisms. Show the organisms’ adaptations to their habitat. Illustrate the profile with drawings or photographs of your organisms.
Choose two organisms (one plant, one animal) from the list below, or pick another organism that lives in the Lake Pontchartrain Estuary. Conduct research about the physical, physiological, and behavioral adaptations of your chosen organisms (behavioral adaptations apply to animals only). Use books, the Internet, and a visit to an aquarium to collect information.

**Plants**
- Wiregrass
- Cordgrass
- Louisiana iris
- Bald cypress
- Wild celery or Turtle grass
- Bulltongue
- Black mangrove

**Animals**
- Blue crab
- Shrimp (brown, white, grass)
- River otter
- Red fish
- Mullet
- Saltmarsh periwinkle
- Tarpon
- Brown pelican
- Ibis

**Answer these questions about your chosen organisms:**

1. What adaptations do the organisms possess to suit them to the estuarine environment? For example, does the animal migrate to places with the right conditions (behavioral)? Do the animals have specialized body parts for obtaining food in an estuary (physical)? Do the plants excrete salt from its leaves or store salt in fleshy leaves (physiological)? Do they have special roots for getting oxygen (physical)?

2. Do any of these adaptations enable the organisms to survive the changes in salinity and other conditions that take place in the estuary?

3. What adaptations do the organisms possess that help avoid predation (being eaten) in the estuary?

4. Do any adaptations make the organisms vulnerable and less likely to survive?
# What Makes Me So Special?

## Adaptations of Estuarine Organisms

<table>
<thead>
<tr>
<th>Estuarine Plant</th>
<th>Estuarine Animal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical Adaptations</strong></td>
<td><strong>Physical Adaptations</strong></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
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<tr>
<td>2</td>
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<tr>
<td>3</td>
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<tr>
<td><strong>Physiological Adaptations</strong></td>
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<td>1</td>
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<tr>
<td><strong>Behavioral Adaptations</strong></td>
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<td>1</td>
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</tbody>
</table>

### Definitions:

**Physical Adaptation:** Specialized body parts or structures that enable the animal or plant to succeed in its particular habitat.

**Example:** Spines instead of leaves on a cactus reduces water loss.

**Physiological Adaptation:** A function of the body’s organs or cells that help the organism survive in its particular habitat.

**Example:** A camel’s ability to store excess water.

**Behavioral Adaptation:** A behavior that helps an animal to survive in its particular habitat.

**Example:** Bird migration to places where food is plentiful during winter months.
Extensions:
When the research and writing is complete, the students can present their findings to the class and the illustrated profiles can be displayed in school for others to see.

Assessment Procedure:
Assess the students according to how thoroughly they research the adaptations, how relevant the chosen adaptations are to life in the estuary and how well they present their findings, both orally and in the written profile.

<table>
<thead>
<tr>
<th>Point Value</th>
<th>Research of Adaptations</th>
<th>Written Profile of Organisms</th>
<th>Orally Presented Profile of Organisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Superficially researched. No more than one kind of adaptation described.</td>
<td>Contains sketchy information, showing little relevance to life in the estuary. Few, if any illustrations.</td>
<td>No relevant detail given about adaptations to the estuary. Presentation brief and awkward.</td>
</tr>
<tr>
<td>2</td>
<td>Adequately researched. Covers more than one kind of adaptation.</td>
<td>Content about adaptations brief and shows some relevance to life estuary. Contains at least one illustration.</td>
<td>Few relevant details given about adaptations to the estuary. Presentation short.</td>
</tr>
<tr>
<td>3</td>
<td>Well researched. Covers all three kinds of adaptation.</td>
<td>Content adequate, showing relevance to estuary. Adequate illustrations.</td>
<td>Some good, relevant information given about adaptations. Adequately presented, but still quite brief.</td>
</tr>
<tr>
<td>5</td>
<td>Outstandingly researched. All three kinds of adaptation were covered thoroughly.</td>
<td>Detailed, well-written content, shows excellent understanding of adaptations to estuary. Excellent illustrations.</td>
<td>Presentation contains outstanding details. Presented in an entertaining and informative way. Appropriate length.</td>
</tr>
</tbody>
</table>

Maximum points: 15