2. WHY WORRY ABOUT WETLANDS?
Chapter 2: Essential Questions:

Why worry about wetlands?

What is a wetland?

Why are the wetlands valuable to us?

What is a healthy wetland?

How do plants and animals survive in the wetlands?
WHY WORRY ABOUT WETLANDS?

I’m like a kid in a candy store with all the nature around me. I am absolutely positive that I have learned more things about marsh ecology in the last 24 hours than I had the entire previous 16 years of my life. Hopefully, tomorrow will be the same.

Ben Gerrets
Project F.U.R. team member

OBJECTIVES:

- To develop an awareness of the functions and values of wetlands.
- To understand the relationship between healthy wetlands and the quality of life in the Lake Pontchartrain Basin.
- To demonstrate understanding of the cause-and-effect relationship between wetland loss and other environmental issues in the Lake Pontchartrain Basin.

MULTIPLE INTELLIGENCES LEARNING ACTIVITIES:

Verbal/Linguistic: Write captions for a calendar on the biodiversity of the Lake Pontchartrain Basin. Write summaries of newspaper articles and reflective journal entries on weekly events that occur in the Basin.

Logical/Mathematical: Graph results of “feeding” niches of wetland birds. Evaluate a local wetland for its ecological health.

Visual/Spatial: Design a calendar of exotic, introduced, endangered, and threatened species in the Lake Pontchartrain Basin. Develop a chart illustrating causes and effects of wetland loss in the Lake Pontchartrain Basin.

Bodily/Kinesthetic & Musical/Rhythmic: Compete for food in “Bird Beak Buffet”. Evaluate a wetland site for relative functions and values.

Interpersonal: Work cooperatively to develop a consensus on the ecological health of a wetland site in the Lake Pontchartrain Basin.

Intrapersonal: Interview family, friends, and peers on present observations and past changes witnessed in the Lake Pontchartrain Basin.

Naturalist: Observe and compare wildlife and plants in a wild setting and an urban or suburban setting.
The Lake Pontchartrain Watershed is extensive and comprises many diverse habitats. Water moves across fields and through forests as it finds its way to small streams in the forested hills north of the Lake. This same water joins large rivers and bayous as it journeys downward to the gulf. One common factor uniting the entire watershed is that all of its water eventually arrives in a wetland for final filtering and purification before it empties into the Gulf of Mexico.

Wetlands surrounding the Lake Pontchartrain Basin are quite diverse. They range from freshwater, river forests (riparian wetlands) in the northern part of the Basin, through cypress/tupelo swamps in the western and middle portions of the Basin, to fresh, intermediate, and finally brackish and salt marshes in the extreme eastern end. It is easy to tell the difference between swamps and marshes because marshes have no trees. The difference between swamps and river forests and among various marsh types are more difficult to determine. Distinctions are usually determined by the dominant vegetation types.

River forests are made up of mostly trees like bald cypress, tupelo gum, certain types of oak, magnolia, beech, as well as scrubby shrubs like palmetto and wax myrtle. These river forests usually drain into some other type of wetland such as cypress/tupelo swamps or fresh marsh before emptying into Lakes Maurepas or Pontchartrain. Cypress/tupelo swamps, as you might have guessed, are comprised almost exclusively of cypress and tupelo gum trees, but also contain some understory shrubs like button bush and wax myrtle, along with many aquatic plants such as water hyacinths and duckweed as well as semi-aquatic plants like spider lilies, swamp lilies, and irises. Marshes generally have little or no trees, but each marsh type has its own particular vegetation types, such as Spartina alterniflora, Spartina patens, or Sagittaria lancifolia.

Just as each wetland type is characterized by different kinds of vegetation, each wetland type is also home to particular kinds of animals and plants adapted to living in these special habitats. Some of them are being outcompeted for resources of food, sunlight, space, and shelter by exotic or introduced species. Others have become endangered or threatened due to habitat destruction or water pollution. Following is an activity that will focus student attention on this issue.
ACTIVITY: Countdown Calendar

Extinction is the death or elimination of all the individuals of a particular species. It is a natural and common event in the long history of biological evolution. Of the estimated five hundred million species of organisms that are believed to have ever existed on earth since life began, only about five to ten million are currently alive. This represents an extinction rate of 98-99%. Many organisms, however, have become extinct as a result of human activities. The most destructive of these is habitat degradation. Humans modifying the environment for their own purposes has had disastrous results on the biodiversity of the planet. Species extinction is rapidly accelerating.

Objectives:

- Focus on the impact of habitat loss on the biodiversity of the Lake Pontchartrain Basin and relate it to impact through modification of the environment in the Basin.

- Identify endangered/threatened/introduced species of plants and/or animals in the Lake Pontchartrain Basin.

- Identify the causes of the endangered or threatened status of those plants and/or animals.

- Identify the causes of the introduction of exotic species of plants and/or animals into the Lake Pontchartrain Basin.

- Recognize that human activities and competition from introduced species can increase the rate of extinction of native species.

Materials:

- Construction paper
- Typing paper
- Magazines with pictures of endangered/threatened/introduced species of plants and animals
- Scissors, glue or tape
- Computer with calendar program (if available)
Getting Ready:

Biodiversity of the planet will have been discussed prior to this in a unit on ecology.

1. If a computer calendar program is available, students may use it to produce their calendars. If not, calendars may be made by hand.

2. Research/find a list of the endangered/threatened/introduced species of plants and/or animals in the Lake Pontchartrain Basin. Refer to Pages 177 & 178.

3. Search through magazines, newspapers, or a resource file for pictures of 12 endangered/threatened/introduced plants and/or animals found in the Lake Pontchartrain Basin. Students may draw all their pictures or any pictures that can’t be found.

4. Research 12-15 facts about each species, including the reasons for its status, its range in the Basin, the type of habitat it occupies, any efforts to save the species, etc.

Procedure:

1. Glue each picture to a sheet of construction paper or typing paper as the calendar pictures.

2. Prepare twelve 8.5” x 11” sheets of paper, one for each month of the selected year.

3. On each page of the calendar, fill in the facts for a particular species on twelve to fifteen days of that month.

4. Assemble the calendar, matching the picture of the plant or animal with the month containing facts about that species.

5. Make front and back covers for your calendar. Decorate the front cover with an outline of the Lake Pontchartrain Basin and appropriate pictures. On the back cover, write facts about endangered/threatened/introduced species in general.

Extensions/Portfolio:

1) Ask your students to be investigative reporters for a newspaper. Have them interview one another about endangered/threatened/introduced species they’ve researched in making their calendars. Questions should include the “who, what, when, where, and why” of the issue.

2) Have the reporters present their findings about the endangered/threatened/introduced species in creative ways: by writing an obituary about a soon-to-be extinct species, by drawing an editorial cartoon, or by writing a newspaper story about an endangered/threatened/introduced species.

3) Publish the students’ work in a newsletter about endangered species and the threat to biodiversity of the Lake Pontchartrain Basin—or send the article to the Lake Pontchartrain Basin Foundation for possible publication in its newsletter.

Family/Community Participation:

1) Which endangered species are found in your parish? What are the reasons for their endangered status? What effect have introduced species had on the native flora and fauna of your area?

2) Of what value are Louisiana’s wetlands to the issue of biodiversity? On audio- or videotape, interview a family member or friend over the age of 50. Ask them to discuss changes they have witnessed in the Lake Pontchartrain Basin during their lifetime.
I'm seeing and doing things I never thought I'd ever do. Field work is exposing me to animals, plants, and places that, by studying them, are helping me to better understand the environment and what I can do to preserve it for future generations.

Doug Dalier
Project F.U.R. team member

Wetlands have often been described in the past as dreary, disease-ridden, insect-infested worthless chunks of “land”. They weren’t considered fit for anything unless one could drain them in an attempt to create more “usable” land. It may surprise you to know that some people still hold this idea today. Fortunately for us all, these kinds of thoughts are rapidly being replaced by factual knowledge concerning the true functions and purposes of wetlands.

Among the many functions attributed to wetland ecosystems are flood control, water purification, storm buffers, wildlife habitat, nursery grounds for larval fish and shellfish, and recreational areas.
These qualities alone provide sufficient reason for us to devote much time and energy to the restoration and preservation of wetland ecosystems. Perhaps it is equally important to inform others of the many roles wetlands play in our daily lives and to stress the need for understanding the delicate balance of these ecosystems as well as how seemingly unrelated events can dramatically alter the health of our wetlands.

While wetlands constitute only a small percentage of the total land area in the lower 48 states, 40-45% of those wetlands are in Louisiana.

In 1990, there were 3.3 million acres of coastal wetlands in Louisiana, with approximately 483,400 acres in the Lake Pontchartrain Basin.

**NUMBER STUMPER!**

What percentage of Louisiana’s wetlands are located in the Lake Pontchartrain Basin?


**THE FUNCTIONS AND VALUES OF WETLANDS ARE OF PARAMOUNT IMPORTANCE TO US ALL AND THEIR CONTRIBUTION TO SOCIETY IS ENORMOUS. LET’S TAKE A CLOSER LOOK:**

**WETLAND FUNCTIONS & VALUES IN LOUISIANA:**

**COMMERCIAL VALUES:**

Commercial fishing has a direct dockside value of almost $4 billion in the U.S. More than 70% of that value consists of species that spend part of their life cycle in coastal wetland estuaries. Louisiana’s coastal wetlands serve as a valuable nursery area for shrimp, oysters, menhaden (“pogey”), blue crabs, and many finfish species. This harvest is a vital part of Louisiana’s economy, providing millions of dollars and thousands of jobs each year.

Alligators, once endangered in many parts of their local range, are a success story for proper wildlife management. More than 25,000 wild alligators are taken from Louisiana’s wetlands each year for their hides and meat.
Furbearing animals such as nutria, mink, raccoon, otter, muskrat, bobcat, and beaver are found in great abundance in Louisiana's wetlands. About 40% of the nation's wild fur harvest comes from here. A strong fur market is a logical, valuable solution to the problem of nutria “eat-outs” in marshes of the Lake Pontchartrain Basin and the resultant wetland loss. It would provide an effective means of producing income for trappers while reducing the extensive damage to wetland vegetation caused by these members of the rodent family.

Oil and natural gas production are vitally linked to Louisiana's wetlands, providing jobs for residents and revenue for government services. This has a total value exceeding $550 million annually. Important products, like sand and gravel, are also mined from coastal wetlands. An important question for the future will be how to continue to reap the benefits of these industries while reducing damage to the environment.

Forestry is another important value of wetland areas. Forested wetlands make up more than 82 million acres of forests in the U.S. Timber production in southern wetland forests has an annual value of over $10 billion. Properly managed, this vital resource will continue to provide both income and jobs for the future. If not managed, the resource can be lost. Beautiful old-growth cypress swamps once existed in the LaBranche Wetlands and in the Manchac Wildlife Management Area, but those regions were heavily logged, and their extensive cypress forests are now gone.

**RECREATIONAL VALUES:**

More than 330,000 hunting licenses and 900,000 fishing licenses are sold every year in Louisiana to sportsmen and women. Those hobbies are closely related to wetlands-dependent species of ducks, geese, and fish, but their economic value exceeds the cost of buying a license alone. Purchases such as gasoline, bait, tackle, ammunition, food, boat launch fees, hunting leases, and other items result in a combined commercial value of over $1 billion.

The swamps, bayous, and marshes represent a cultural value as the home of many Louisiana residents who have a strong dependence on the wetlands for their food and livelihood. This culture is unique to Louisiana and is intertwined with other recreational and commercial values of the wetlands.
CULTURAL HERITAGE VALUES:

People enjoy wetlands for a variety of reasons, and Louisiana’s wetlands constitute a world-renowned ecological resource attraction. Some of the activities that bring visitors to our wetlands are boating, swimming, camping, water-skiing, hiking, birding, photography, journaling, and painting.

WILDLIFE HABITAT:

Wetlands produce enormous amounts of organic material and detritus, which is directly linked with wildlife and fisheries productivity. This makes wetlands two to three times more productive than very fertile agricultural land. The abundant vegetation found in wetland areas supplies food and shelter to the many organisms found in that ecosystem.

Wetlands are known for their incredible biodiversity. Hundreds of non-game mammals, fish, birds, reptiles and amphibians, as well as over 50 wild game and fish species, inhabit wetland areas. Currently, 79 species of animals and plants found in U.S. wetlands are on the threatened or endangered species list due to wetland loss. Over 100 other species are nearing that distinction. In the Lake Pontchartrain Basin, the Louisiana Black Bear has almost disappeared from its range, while the American alligator and the brown pelican have made dramatic comebacks.

WATER QUALITY:

One of the most valuable functions of wetlands is their ability to filter sediments, nutrients, and chemical pollutants from the water which flows from land. Wetland plants are able to remove nitrogen and phosphorus from runoff water, especially near agricultural areas. Other wetland plants help remove heavy metals, sewage, and pesticides, thus preventing them from doing further damage in the ecosystem. These pollutants are also removed in healthy wetlands through chemical processes that occur in water and soil.

Wetlands act both as a sink and as a conduit for water. Percolation of water through soil recharges aquifers which are important sources of drinking water and industrial uses in some communities. Fresh water that flows from wetlands helps support plant and animal life during droughts and can help reduce effects of saltwater intrusion.
Whether as an outdoor classroom for school children or as a field study site for scientific research, wetlands are unparalleled for their educational value. They are ideal places for students of any age to explore the interrelationships among various factors in an ecosystem, as well as to understand the ecological, economic, social, and legal complexities of an important environmental issue.
LAKE LOG:  
A Diary of the Basin

Events that affect the Lake Pontchartrain Basin occur almost every day. Many of them are noteworthy and make important news items. The class can keep a log of such events, much in the way that a scrapbook of personal events is made. This is a wonderful way for students to develop an awareness of the functions and values of wetlands in our watershed, as well as some of the problems associated with them. A large map of the Lake Pontchartrain Basin on the classroom wall can be used to mark sites of particular events and will maintain interest in the project log.

Each student in class should watch the news on television or read the newspaper daily for one week at a time during the year. When an event that affects the ecology of the watershed occurs, the student must listen or read carefully to find out the major points of the issue: who, what, when, where, why. Write a brief summary of the news item and paste it into the Lake Log. Students may include the actual news item, if available, as well as pictures pertinent to the topic.

Of course, field trips to selected sites in the Basin should be recorded in the class Lake Log, too! Student comments about their experiences are especially relevant and welcome.
ACTIVITY: How Healthy is This Wetland?

By observing wetlands, we can usually tell what is occurring in a watershed. The same is true of wetlands in the Lake Pontchartrain Basin. On field trips, students can make both general and specific observations regarding the ecological health of a wetland site. Time should be spent beforehand preparing a base map of the area. This can be done quite easily by tracing an outline of the wetland site from an existing map, including its watershed, ponds associated with it, vegetation types (trees, shrubs, emergent vegetation, or open water), a compass rose, map scale, roads and highways, urban areas, and any other main factors that affect the wetlands. Students should also review the functions and values of wetlands listed here and develop a list of questions for each wetlands-function to help them determine its contribution to the overall health of the ecosystem.

Armed with this prior knowledge, students will be able to add the information they collect in the field to their base map.

Materials:

- Base Map (constructed in class prior to the field trip)
- Markers, Pencils
- Field Guides to wetland plants and animals
- Binoculars
- Camera/Film
- Dip nets or Seine nets
- Background information on the wetland site
- Copies of the “Lake Pontchartrain Basin Wetland Site Evaluation Sheet” (next page).

Procedure:

1. Work in cooperative groups. Your primary purpose is to develop skills in observation and data collection, while evaluating wetland functions and values at this Basin site. Do not concentrate on specific, factual answers as much as on discussing and learning about this wetland.

2. Using information from maps, printed materials, and field observations, rate the wetland site on an overall rating of high, medium, or low for each wetland function.

3. Record your results on the summary sheet, and compare your group’s work with that of others.

4. Evaluate each wetland you study on its strongest and weakest characteristics.

5. Discuss the natural and human factors existing in the Lake Pontchartrain Basin that contribute to the ecological characters of each wetland.
# Lake Pontchartrain Basin Wetland Site Evaluation Sheet

<table>
<thead>
<tr>
<th>WETLAND FUNCTION</th>
<th>LOW</th>
<th>MEDIUM</th>
<th>HIGH</th>
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</thead>
<tbody>
<tr>
<td>Naturalness of site</td>
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<tr>
<td>(Has it been altered in any way?)</td>
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<tr>
<td>Vulnerability</td>
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<tr>
<td>(Is it in any danger of contamination or development?)</td>
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<tr>
<td>Wildlife habitat</td>
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<tr>
<td>Educational value</td>
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<tr>
<td>(Is it easily accessible? Is safety a concern?)</td>
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<td></td>
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<tr>
<td>Aesthetic value</td>
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<td></td>
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<tr>
<td>(Rate its natural beauty.)</td>
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<td></td>
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<tr>
<td>Recreational value</td>
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<tr>
<td>(Canoeing? Fishing? Animal observation?)</td>
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<tr>
<td>Stormwater storage</td>
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<tr>
<td>Groundwater recharge</td>
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<tr>
<td>Pollution control</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Unique characters</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**COMMENTS:**

On the back of this sheet, list the species of wetland plants and animals observed.
No one consults the frogs when they intend to drain the swamp.
—unidentified French nobleman

During the last 200 years, we have lost 50% of our nation’s wetlands. Louisiana’s coastal wetlands are vanishing at a rate of 20,000 to 25,000 acres per year. If this rapid loss continues, the Gulf of Mexico will be thirty-plus miles closer to New Orleans, and more of our bountiful marshes will become open bays of water.

**ACTIVITY: Where Have All the Wetlands Gone?**

Wetland loss in the Lake Pontchartrain Basin will have been discussed in class. Its relevance to and relationship with other issues should be emphasized. In order for them to become informed citizens able to make intelligent choices, students must develop an understanding of the pressures that wetland loss places on the Lake Pontchartrain Basin. This activity provides students the opportunity to discuss cause-and-effect relationships among wetland loss and other issues and to suggest possible solutions.

**Materials:**
- Copies of student handout
- Butcher Paper
- Pencils
- Markers

**Procedure:**

**Note:** Students will work in cooperative learning groups.

1. Each student in the group will complete the handout “Where Have All the Wetlands Gone?” (next page).
2. Students compare answers with group members and reach a consensus.
3. Each group of students should make a large copy of the completed chart on butcher paper.
4. Completed posters should be hung around the room as each group presents its results to the class.
5. After a discussion period, a class consensus can be developed for a bulletin board display.
Wetland Loss in the
Lake Pontchartrain Basin

RELATED ISSUES:

CAUSES:

SOLUTIONS:

EFFECTS:
ACTIVITY: Bird Beak Buffet

A bird’s beak is basically a lightweight, bony elongation of its skull. The beak is covered with skin that produces keratin, the same material found in human fingernails and hair. On most birds, the keratin condenses and dries, forming the beak’s hard, glossy, outer covering. The tip and cutting edges of the beak are constantly renewed as they wear away, just as human nails are.

Bird beaks are multi-functional tools. Birds use them to weave nests, defend their territory, attack competitors, groom feathers, communicate, and most significantly, to gather or capture food.

Over the years, a wide assortment of bird beaks has evolved. Though many birds have straight beaks that are adapted to general feeding, some birds’ beaks are examples of unique adaptations.

Birds in the Basin

Unusual Bird Beaks and Their Uses:

- Eagles and other raptors have strong, hooked beaks for tearing fish.
- Anhingas and herons have dagger-like bills for spearing and grasping fish and frogs.
- Pelicans have pouches for scooping up fish.
- Hummingbirds’ beaks protect their long tubular tongues, with which the birds extract nectar from flowers.
- Swallows and whippoorwills use their wide, gaping beaked mouths to catch flying insects in mid-air.
- Cardinals and grosbeaks have short, cone-shaped beaks for cracking open seeds.
- Snipes have beaks for probing in mud and water to find worms and other small animals.
- Woodpeckers have chisel-like beaks for searching under tree bark to find insects.
- Yellowbellied sapsuckers have drill-like beaks for boring into trees to feed on sap and the insects attracted to it.
All animals are adapted to their environment in unique ways. A very important adaptation for food gathering in birds is the size and shape of the beak. In this activity, we will focus on different types of bird beaks and discover how each type of beak functions in collecting specific types of food.

Students, using everyday objects that model different bird beaks, will try to gather the food and place it in their “stomachs”. A class discussion on specialization of each beak type should follow.

Materials:

**Suggested Food Resources:**
uncooked shell macaroni, goldfish crackers, M&M® candies, gummy worms, chocolate sprinkles, peanuts, sunflower seeds, raisins, mini-marshmallows, cereals (you get the idea!) For an interesting ending, try individual cups of pudding for each student!

**Beaks** (utensils): one set per group
clothespin, toothpick, straw, spoon, small plastic scoop, tweezers/small scissors

**Other Materials:**
paper plate for feeding dish (1 per group), small cup for stomach (1 per student), whistle/bell to signal change of feeding

Instructions:

Students should work in groups of 4-6, either at a table or around a clean mat on the floor. Distribute one type of “beak” (utensil) to each student, instructing him/her to hold it in one hand and place the other hand behind his/her back. Place a “stomach” (cup) in front of each student. Place one type of food in each group’s feeding area (plate) and instruct students that, at your signal, they must compete for as much of that food resource as they can gather with their “beaks”. Remind them that their survival depends on their ability to gather food. Give the signal; then allow each group 5-10 seconds to “feed”. All food must go into their “stomach” (cups)! After 10 seconds, give the signal to stop. Have the students tell which beak was most successful in gathering that type of food. Repeat the procedure for each type of food available.

Extensions:

1) Have students predict which type of beak will be successful in collecting each food type.

2) Ask students to compare each of the food items to things that birds really eat like snails, grubs, worms, seeds, and other things.

3) Give each student a small brown bag in which to store the food collected. If you use all edible items, students may eat them later as a reward snack.

4) Repeat the food-gathering activity with some types of foods floating in a plastic container of water.
5) Have the students sort the food they collected into small piles and construct a data table to record how much of each food they collected per beak type.

6) Using the class data, construct a bar graph, with food types along the horizontal axis and beak types along the vertical axis. Discuss the results with the class.

7) Discuss with the class the differences between a bird specialist (one that eats only a certain type of food) and a bird generalist (one that eats a variety of foods). Relate these ideas to habitat destruction, competition, and ecological niches.

BEFORE AND AFTER:


2) Have students bring in pictures of birds found in the Lake Pontchartrain Basin for a classroom display.

3) Assign each student a different type of bird found in the Basin to research, particularly its beak type and the type of food it eats. Report to the class.

4) Invite a speaker from the local Audubon Society to make a presentation to the class.

5) Take the class bird-watching around the school grounds. Discuss their observations. Have students repeat this in their own neighborhood and share their observations with the class.

6) Write syntu poetry about bird beaks. (Refer to Page 313 for an example of a Syntu).

7) Make bird beak masks with construction paper.

8) Read books or stories about birds to the class. Stellaluna provides interesting comparisons between lifestyles of birds and bats.

9) Take a learning expedition to Turtle Cove Environmental Research Station, Audubon Zoo, Bayou Sauvage National Wildlife Refuge, Northlake Nature Center, parks or other sites suitable for observing large numbers of birds. Based on your observations of the birds you see, record and analyze the adaptations of five different types of birds.

10) Build different types of bird feeders and hang them in the schoolyard for daily observation of feeding behaviors.

11) Research other specific adaptations of birds, such as those required for locomotion, reproduction, or protection.

12) Construct an ecological community in a shoebox, including birds specially adapted to that particular habitat. Set up an exhibit in the school library, or use them to make presentations for other classes.
13) Write a short story: “The Bird I’d Most Like to Be”.
14) Compare and contrast fish with birds that live in water.
15) Develop a student magazine on the class discoveries about bird adaptations.
16) Write a riddle or poem about a kind of bird frequently seen in the Lake Pontchartrain Basin. Draw an outline of the bird and write the riddle or poem inside.

ASSESSMENT:

Students should be able to

1. Compare and contrast a variety of bird beaks.

2. Describe how a beak is adapted to the type of food eaten by a bird species.

3. Provide evidence for conclusions.

4. Graph and interpret data.

5. Design a beak for a specific function.

REFERENCES:

Some of these activities have been adapted from:

(1) an activity titled “Bird Beak Buffet” by Rita Mae Alsup.

(2) “Breakfast for the Birds”, a publication printed for National Science and Technology Week, 1993-94.


Objectives:

Students will:

1. observe plants and wildlife in a wild and urban or suburban setting;
2. make comparisons between the wildlife seen at the two sites;
3. keep a record of observations;
4. analyze the results of the observations, and
5. draw conclusions about the differences in numbers and species of plants and animals observed in the two locations.

Teaching Materials:

- Handout “Survey Report Form” (Page 46)
- Field guides that include local organisms (wildflowers, trees, birds, reptiles, amphibians, insects, spiders, and mammals)
- Cameras
- Binoculars
- Notebooks
- Pencils

Getting Ready:

1. Arrange a field trip to a nearby wildlife area (e.g., Bayou Sauvage National Wildlife Refuge, Audubon Louisiana Nature Center, and LaCouterie Nature Trail in City Park in New Orleans or Northlake Nature Center and Fontainebleau State Park in Mandeville). If these areas are not easily accessed, consider a nearby park. Call the Lake Pontchartrain Basin Foundation to get A Guide to the Wetlands of the Lake Pontchartrain Basin.

2. Choose an area around your school that will make a good observation site. A walking field trip in the neighborhood may work well.

3. Discuss observation skills with your students prior to the trip. Stress the importance of being quiet and patient.
Procedure:

1. During the field trips (both neighborhood and wild), choose an appropriate time and location to direct the students in their observation exercise.

2. Divide the students into small groups. With a smaller class, they can work individually or in pairs.

3. In the groups, one student can be the recorder, another a “spotter,” and another the photographer. Other tasks may present themselves.

4. Give each group a small area in which to concentrate its observations. Tell the students to sit quietly for several minutes, watching for signs of wildlife. Tell them to record the types of plants they see, as well as animals and signs of animals’ presence (footprints, spider webs, droppings, etc.). A species name for plants is not essential. Encouraging a description of the size, shape of leaves, color of flowers, texture of bark, etc. gets the students to look closely. The photographer should record the site, capturing the plants, trees and signs of wildlife (footprints, droppings or animals themselves).

5. Rotate among the groups, helping them identify what they see.

6. Gauge your class’ attention span in this kind of activity. It will vary widely among groups. When you know your group is ready to move on, regroup the class and discuss their observations, calling on a group spokesperson to report on each small group’s discoveries. Encourage descriptions of organisms.

7. Discuss adaptations of the organisms to their environments.

Extensions:

After completing two observation trips, have the class compile a master list of plants and animals seen in the two places. Compare numbers of organisms and use the following questions to guide research and discussion, analyzing the differences between the two lists. Alternatively, these questions can be given as an individual research and writing assignment after a discussion in class.

- Which site contained a wider variety of organisms?
- What do numbers and types of organisms tell you about the health of the two ecosystems?
- What is the impact of human activity on the organisms in the two sites?
- What are the specific survival requirements of two of the organisms you observed in each of the two places?
- Do the organisms at one site have more specialized needs? Give examples.
- How do the organisms within one site compete with each other for basic survival needs?
- If you were a “wildlife habitat real estate agent,” how would you describe the two places in order to attract new residents?
This activity could be adapted to the observation of aquatic organisms in two contrasting bodies of water such as a bayou in a wildlife refuge and a city park pond. In this case, students can separate aquatic organisms into groups that are “more pollution intolerant, less pollution intolerant, and pollution tolerant.” For more information on the technique of macroinvertebrate sampling, see the Isaac Walton League of America’s web site: www.iwla.org.

**Assessment Procedures:**

Assess the students according to their ability to participate successfully in the observation activity, their participation level in identifying and describing observed organisms, and their ability to answer the analysis questions and to draw conclusions about the comparisons made.

Use the following scale. A higher number denotes greater observation skills.

<table>
<thead>
<tr>
<th>Point Value</th>
<th>Observation of plants and animals in a wild setting:</th>
<th>Observation of plants and animals in an urban or suburban setting:</th>
<th>Completion of data form</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bystander</td>
<td>Bystander</td>
<td>Very incomplete (did not report most sightings)</td>
</tr>
<tr>
<td>2</td>
<td>On-looker</td>
<td>On-looker</td>
<td>Incomplete (reported about 50% of sightings)</td>
</tr>
<tr>
<td>3</td>
<td>Good observer</td>
<td>Good observer</td>
<td>Complete reporting</td>
</tr>
<tr>
<td>4</td>
<td>Keen observer</td>
<td>Keen observer</td>
<td>Very well recorded observations</td>
</tr>
<tr>
<td>5</td>
<td>Trained observer</td>
<td>Trained observer</td>
<td>Outstanding record of field observations</td>
</tr>
</tbody>
</table>

Maximum points: 15
Survey Report Form

Name(s) of observer(s) ____________________________________________________________________________________
_________________________________________________________________________________________________________
Date______________     Location_______________________________________

Plants

Birds

Mammals

Insects

Reptiles and Amphibians

Fish/Shellfish

Miscellaneous

ACTIVITY:
Fibonacci Hunt: Go for the Gold!

Objectives:
1. Use field experiences to observe patterns in the natural world.
2. Observe and collect ecological information about wetland plants and animals.
3. Understand adaptations of plants and animals to wetland ecosystems.
4. Apply mathematical formulas to natural objects.

Note: If it is not possible to provide students with a field experience, this activity can be conducted with materials obtained from the supermarket, science supply companies, the school grounds, and/or student collections.

Teaching Materials:
- Natural objects: pinecones, leaves, flowers, shells, fruits, vegetables, etc.
- Knives
- Calculator
- Graph paper with large squares
- Copies of the handout “Fibonacci Hunt: Go for the Gold!” (Pages 49-51)
- Copies of the handout “Going for the Gold!” (Page 51)
- Copies of the handout “Fibonacci Treasure Hunt” (Pages 52-53)
- Paper
- Pencil
- Camera (optional)

Getting Ready:
2. Review use of calculators and math skills involving ratio and proportion with students.
3. Prepare field trip.
4. Organize students into partner pairs, if desired.

5. Distribute handouts “Fibonacci Hunt: Go for the Gold!”, “Going for the Gold!” and “Fibonacci Treasure Hunt.”

**Procedure:**

1. Review and discuss with your teacher and peers the information about Fibonacci numbers contained in the handout “Fibonacci Hunt: Go for the Gold!”

2. Review and discuss with your teacher and peers the information about golden patterns and the golden proportion contained in the handout “Going for the Gold!”

3. Organize materials needed for this activity.

4. Working alone or with a partner, follow instructions on the “Fibonacci Treasure Hunt” handout.

**Extensions:**

Have students take photographs or draw sketches of nature’s shapes and patterns for a display in the school library or cafeteria. Some public libraries or office buildings welcome displays of student work.
In the 12th Century, an Italian named Fibonacci discovered a sequence of numbers that helps explain the mathematics we find in nature. We call that sequence the Fibonacci numbers. These numbers are one way to look at nature and to discover nature’s secrets. Let’s see how they work! Once you know how the numbers work, you can look for them all around you.

The sequence begins like this: 1, 1, 2, 3, 5, 8...
Can you predict the next number in the series?

To get the next number in the sequence, add the two numbers that come before it. Here’s the plan: we’ll get you started, and you finish the sequence!

\[
\begin{align*}
0 + 1 &= 1 \\
1 + 1 &= 2 \\
1 + 2 &= 3 \\
2 + 3 &= 5 \\
3 + 5 &= 8 \\
5 + 8 &= 13
\end{align*}
\]

8 + 13 = ___
___ + ___ = ___
___ + ___ = ___
___ + ___ = ___
___ + ___ = ___

You can keep going, but I think you’ve got the hang of it now. The largest Fibonacci number that people have found has hundreds of digits, but we don’t need to go that far. We want to use Fibonacci numbers to help observe living things. There are Fibonacci numbers EVERY-WHERE in nature! Let’s explore some examples.

If you’re lucky enough to find a perfect daisy, the number of petals it has may be in the Fibonacci series. You might find 13 petals in a small daisy, 21 in another daisy, or 34 in a perfect, large daisy. Remember: petals blow off and fall off. We don’t always find a perfect flower. Try counting the petals of other types of flowers. If you count enough of any one kind of plant, you’ll often find Fibonacci numbers.

You can “count on nature” in fruits and vegetables, too. Cucumbers, tomatoes, and pears work well. For example, slice a fruit or vegetable in half through the thickest part and count the sections inside. You will find the seed cavities are present in the Fibonacci numbers such as 3, 5, or 8.

Where else can you find Fibonacci numbers in nature? Look for them in clusters of pine needles, too. They will almost always occur in clusters of 2, 3, or 5.

Sometimes Fibonacci numbers are called the pinecone numbers. Here’s why. The spirals on a pinecone are a type of leaf called bracts. They are hard and packed together, and they protect the seeds of the pinecone in all kinds of weather. If you observe pinecone bracts closely, you can see that they circle the pinecone in a spiral pattern. The spirals overlap, but you should be able to clearly see two patterns of spirals. In one pattern the spirals rise from the
bottom to the top of the pinecone, rising at a steep angle. This pattern of spirals is so steep that it is almost vertical. In the other pattern the spirals are nearly horizontal. These overlapping spirals rise gradually and circle around and around the pinecone.

Are you ready to count some pinecone spirals? Let’s do it! Here’s How:

1. Obtain 2-3 pinecones for comparison.

2. Take your time counting the overlapping rows because it is easy to become confused. As you rotate the pinecone in your hand, touch each bract. This will make it easier to follow the spirals around the cone.

3. Mark each ROW of bracts with a colored marker.

4. Count the gradual ROWS of bracts: ________

5. Count the steep ROWS of bracts: ________

6. Express the two numbers as a proportion: ___/____

You should have observed a set of Fibonacci numbers, such as 3/5, 5/8, or 8/13. When we express the numbers as a proportion, we are showing how one part of the pinecone relates to another. It is all part of nature's way of helping pine trees survive. For examples like this one, count the rows in pineapples, artichokes, or sunflowers.

How do the Fibonacci numbers help plants survive? To find out, it’s time to conduct some observations. Ideally, you’ll want to do this activity outdoors, but it can be done indoors if enough plants are available.

Select a plant or tree and look carefully at the growth spirals on it. Can you observe how the buds, twigs, or leaves grow at different angles? Within each spiral no twig or leaf is directly over another twig or leaf. Because plants need light and moisture to survive, no twig or leaf should block out all the light from the twig or leaf directly under it. (How can you test this indoors?) When the twigs and leaves in each spiral grow at different angles, these angles let the sunshine in! When it rains, water should hit all the twigs and leaves of a plant. If they grow at different angles, all of them can receive almost equal amounts of water. (How can you test this indoors?) That’s how nature’s math helps plants and trees survive and prosper.
GOING FOR THE GOLD!

Are you aware that gold is all around you? No, not the precious metal; we’re talking about another kind of gold. It’s a golden pattern, a design that is repeated inside and out. You can see it in nature, art, and architecture. The ancient Greeks called this pattern the golden proportion because it represents both beauty and balance. Once you learn to find it, you’ll see this golden pattern in many parts of our world.

The golden pattern is based on mathematical proportions, or the way one part of an object is related to another part of that object, such as length and width. In a rectangle with golden proportion, the length is longer than the width in the same way as another “golden” rectangle. Get out your calculator and let’s explore that idea!

The mathematical formula for the golden proportion is \( \frac{1+\sqrt{5}}{2} \). When you insert that equation into your calculator, you get the golden answer: 1.618034. Round that answer off to 1.6.

Did you know that the golden proportion is related to the Fibonacci numbers? Keep that calculator handy! If you divide each Fibonacci number by the next higher number in the series, eventually you will get an answer close to 0.618034. Which two Fibonacci numbers divided result in that number?

Now turn the calculations around. If you divide each Fibonacci number by the next lower number in the series, eventually you will get an answer close to 1.618034. Which two Fibonacci numbers divided result in that number?

Now you’re ready to apply the golden proportion. If the small side of an object is 1 part, the large side of that object should be approximately 1.6 parts. Or you can apply it the opposite way: if the large side of an object is 1 part, the small side should be about 1.6 parts. Get it? Before looking for examples in nature, try drawing some shapes in the golden proportion. In addition to rectangles, you can draw triangles, ovals, and even spirals. Get some graph paper and try it!

Now you’re ready to practice nature’s math. Start with a leaf. It would be best to work with a partner.

1. Hold the leaf tightly or glue it down on a piece of graph paper.
2. Draw a rectangle around the leaf at its widest part.
3. Measure the length and width of the rectangle with a ruler, or count the squares of the graph paper.
4. Express your answer as a ratio between the shorter side and the longer side of the rectangle.

More often than not, the numbers of your golden ratio will be two Fibonacci numbers, such as 2/3 or 3/5!

That was challenging but fun! Try it with other leaves or natural objects, such as flowers, feathers, shells, bones, or those pinecones you used to count spirals.
Want to know more about nature’s math? Dust off your observation skills and look around you. Go on a hunt for five-sided and six-sided shapes in nature. Five-sided shapes are known as pentagons or pentagrams, and they are abundant in the natural world. You just have to look around you!

What shapes and patterns can be found in sand dollars and starfish? That’s right, a pentagon! Can you find flowers with a five-sided pattern?

Here’s more. Select a fruit or vegetable such as an apple, pear, or zucchini. Slice it in half through the thickest part and look at one of the cut sides. What pattern do you see?

What is a six-sided shape called? That’s right, a hexagon. Hexagonal shapes in nature may not be as easy to find as five-sided ones, but we’ll point you in the right direction. A six-sided shape allows nature to fit the most material into the smallest space. Many of nature’s hexagons are either very large or very small. For instance, snowflakes and ice crystals form hexagonal shapes grouped in a 3D pattern. Experiment with growing ice crystals and see if you can identify the pattern. The mineral quartz forms a hexagonal crystal, too. Which other minerals cool into hexagonal patterns?

Where else can you see hexagons in nature’s creations? Just check out your local grocery store or farmer’s market. In the produce aisle, look at the outside of a pineapple. (Remember to count the spirals of the leaves on top!?) How about a corn cob? What’s the pattern? Now find the aisle where honey is located. Look for a jar that has a section of the honeycomb inside.

Look closely and observe the pattern of the honeycomb.

Hexagons, all packed closely together! Other than in fruits and vegetables, you can see nature’s six-sided wonders at the local zoo, nature center, or on a field trip. How many can you find? Hint: look at the shells of turtles and tortoises; look at mud cracks in dry soil. Nature’s beautiful shapes and patterns are everywhere!

Another type of pattern abundant in nature is the golden spiral. Some will be easy for you to find in your explorations; others you might see only in pictures. Seashells, fern fronds, and spider webs are ones that you can easily observe. Have you ever seen the claws of some animals, the tusks of an elephant, the horns of a ram? How about the patterns of hurricanes and galaxies? Ocean waves heading for the surf? These are all examples of nature’s spirals! Can you think of others?

Go on the Fibonacci Treasure Hunt. Find as many objects as you can, but don’t collect anything more than absolutely necessary. Measure the wondrous shapes and patterns you find in natural objects. How many exhibit the golden proportion? See? Now you’ve found out for yourself that gold is really all around you!

**Fibonacci Treasure Hunt**

As you explore the area around you, try to find as many of these natural objects as you can. Disturb the site as little as possible. Whenever you can, do your measurements for Golden Proportions without taking anything. We've left some blank spaces for you to add any other “treasures” you find. It’s okay to repeat the same type of object, such as a flower, as long as it is different from the first one. Good luck!

<table>
<thead>
<tr>
<th>ITEM</th>
<th>SHAPE/DESCRIPTION</th>
<th>GOLDEN PROPORTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed pod</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinecone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flower</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal shell</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal bone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feather</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small insect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spider web</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Did you find any unnatural treasures, such as aluminum, paper or plastic? Do human-made objects exhibit the golden proportion? Why or why not?