

Life in Florida's Freshwater Wetland Communities



Southwest Florida
Water Management District



A Joint Project of the School Board of Hillsborough County and the
Southwest Florida Water Management District

Life in Florida's Freshwater Wetland Communities

Curriculum Development Specialist

Mike Mullins, Nature Coast Environmental Education, Inc.

Curriculum Review Team

Rebecca Bray, Lenea Martel, Raina O'Neil, David Patterson, Chris Rusnak, David Spencer, Janice Sylvain, Mary Torrusio, Cliff Webb, Patricia Yarnot

Acknowledgments

We would like to thank the staff of Nature's Classroom for adopting this program as an elementary outreach.

We would especially like to thank the Southwest Florida Water Management District's Hillsborough River Basin Board for funding the revision of this curriculum. The Board's ongoing support of this important program has contributed significantly to education about Florida's freshwater wetlands.

2006 Edition



Table of Contents

Introduction	iii
Objectives Curriculum Goals, Student Outcomes and Standards	iv
Lesson 1 Wondering About Wetlands	1
Lesson 2 What Are Wetlands?	7
Lesson 3 Types of Freshwater Wetlands	11
Lesson 4 Who Lives in Wetlands?	17
Lesson 5 Investigating a Wetland	30
Lesson 6 Our Valuable Freshwater Wetlands	36
Vocabulary List	43



Introduction

Despite popular perceptions, Florida is more than a place of sandy beaches and theme parks. Florida contains an abundance of natural resources that provide a diverse array of unique flora and fauna.

Many residents are unaware of the connection that all Floridians have with the ecological systems found within the state. However, we have a valuable resource in our students. Once armed with knowledge, they can make a difference in Florida's environmental future.

Life in Florida's Freshwater Wetland Communities is one in a series of curricula created by the Hillsborough County School District's Office of Environmental Education and the Southwest Florida Water Management District (SWFWMD) to increase student awareness and understanding of Florida's wetlands.

The goal of this curriculum is to play a part in the development of citizens who understand the important role wetlands play in our state and how human actions can impact these fragile areas.

Life in Florida's Freshwater Wetland Communities specifically focuses on the flora and fauna found in Florida's wetlands. It is designed for fourth-grade students but can easily be modified for all grade levels.

Class Field Study

The field study portion of this curriculum relates specifically to freshwater wetland sites in Hillsborough County but can be applied to most freshwater wetland sites in Florida. Some ideal sites for this curriculum are Lettuce Lake Park and the Hillsborough Community College Environmental Studies Center at English Creek.

Please see the *Teacher Field Study Checklist* on page 33 to help you plan your class field study.



Objectives

Curriculum Goals

- Help students develop the ecological concept of community.
- Increase student knowledge about the importance of freshwater wetlands in Florida.
- Acquaint students with the common flora and fauna found in Florida freshwater wetland communities, as well as the adaptations that allow them to be successful in these communities.
- Raise students' awareness about the impact humans have on wetlands in Florida.
- Help students understand their connection to freshwater wetlands.

Student Outcomes

Conceptual

Demonstrate an understanding that:

- A healthy community is made up of a diverse group of interacting populations.
- Organisms within a wetland community are adapted to a cyclical supply of water.
- Geographical factors create a variety of freshwater wetland communities in Florida.
- Organisms have special adaptations that allow them to live successfully in a wetland.
- Wetlands are a natural resource.
- Humans have historically had a negative impact on Florida's freshwater wetlands.
- Wetlands can be managed to benefit both wildlife and humans.

Affective

Demonstrate an understanding that:

- Negative feelings about wetlands have hindered their protection.
- Human attitudes toward wetlands in Florida have begun to change.
- Each Floridian has a role in preserving wetland resources.

Process

Demonstrate individually and in groups that they can:

- Generate questions about the nature of freshwater wetlands and wetland organisms.
- Design investigations to increase their understanding of wetlands.
- Record information about wetlands.
- Develop conclusions from observations and investigations.

- Develop agendas that will increase peoples' awareness of wetlands.

State Standards

The Florida Sunshine State Standards are included with each lesson. A summary is listed below.

Language Arts

LA.A.1.2.3: uses simple strategies to determine meaning and increase vocabulary for reading, including the use of prefixes, suffixes, root words, multiple meanings, antonyms, synonyms and word relationships

LA.A.2.2.1: writes notes, comments and observations that reflect comprehension of content and experiences from a variety of media

LA.A.2.2.5: reads and organizes information for a variety of purposes, including making a report, conducting interviews, taking a test and performing an authentic task

Science

SC.F.1.2.3: knows that living things are different but share similar structures

SC.G.1.2.1: knows ways that plants, animals and protists interact

SC.G.1.2.2: knows that living things compete in a climatic region with other living things and that structural adaptations make them fit for an environment

SC.G.1.2.7: knows that variations in light, water, temperature and soil content are largely responsible for the existence of different kinds of organisms and population densities in an ecosystem

SC.G.2.2.3: understands that changes in the habitat of an organism may be beneficial or harmful

SC.H.1.2.4: knows that to compare and contrast observations is an essential skill in science

SC.H.3.2.3: knows that before a group of people build something or try something new, they should determine how it may affect other people

Social Studies

SS.B.2.2.2: understands how the physical environment constrains and supports human activity

SS.B.2.2.3: understands how human activity affects the physical environment

SS.D.1.2.2: understands that limited resources require choices on many levels, from the individual to societal

Lesson 1

Wondering About Wetlands

Primary Concept

Most people do not know much about wetlands. At times, negative feelings about wetlands have hindered wetland protection.

State Standards

Science:

SC.G.1.2.1, SC.H.1.2.4

Language Arts:

LA.A.1.2.3, LA.A.2.2.1, LA.A.2.2.5

Objective

Students will explore their own knowledge and feelings about wetlands.

Activity 1

What Do You Know About Wetlands?

Purpose: This activity will allow you to assess your students' current knowledge about wetlands.

Components/Materials:

What Do You Know About Life in Florida's Wetlands? test from page 3; answer sheet from page 4; answer key from page 5; 3" x 5" cards; chart paper

Teacher Directions

1. Administer the *What Do You Know About Life in Florida's Wetlands?* test to determine your students' current knowledge. Use copies of the answer sheet for students to record their answers. Students should record their answers in the "Pretest" column. The teacher answer key is on page 5. Results of this test may be used as a baseline to gauge student comprehension when the curriculum is complete.
2. Create "Wetland Investigation Teams" to be used throughout the curriculum. Assign four to five students to each team.
3. Use the Word Grouping and/or KWL (*know*, *want to know*, *learned*) process to record student perceptions about wetlands. See explanations of these processes below.
4. Word Grouping
 - a. Use 3" x 5" cards to make vocabulary note cards. See the *Vocabulary List* on page 43 for ideas on words to use. Distribute cards and blank chart paper to each team.

- b. On cards, ask each team to write words, phrases or examples that come to mind when they read the words and their definitions.
- c. When they have finished, have the students write "Florida's Freshwater Wetlands" in large letters at the top of their chart paper. They should then group the words on the chart paper. For example, all the names of animals could be grouped together. Encourage students to add words or notes to their charts as they learn more about Florida's freshwater wetlands.

5. KWL

- a. Use chart paper to make a KWL chart (see illustration on next page) and hang it in the classroom.
- b. Ask your students what they *know* about wetlands. Record their oral responses directly on the KWL chart.
- c. Ask them what they *want* to know about wetlands. Record their oral responses directly on the KWL chart.
- d. Once students complete the *Life in Florida's Freshwater Wetland Communities* curriculum, ask them what they *learned* about freshwater wetlands. Record their oral responses directly on the KWL chart.

Activity 2

Who's Seen a Wetland?

Purpose: This activity will allow more knowledgeable students to share their wetland experiences with other students.

Teacher Directions

Ask the following questions and have students answer them verbally in class:

- How many of you have ever been to a marsh or a swamp?
- What types of plants and animals did you see?
- What are some of the characteristics of these plants and animals?
- What were some of the things you observed about the physical characteristics of the wetland?

KWL Chart

What do we know about freshwater wetlands?
What would we like to know about freshwater wetlands?
What did we learn about freshwater wetlands?

Activity 3

Perceptions of Wetlands

Purpose: This activity will allow students to describe their current impressions of wetlands and what they've learned about wetlands from the media.

Teacher Directions

Ask the following questions and have students answer them verbally in class:

- How do you feel about wetlands?
- What type of feelings about wetlands do we get from television, movies, books and magazines? (Bring up some examples: *Crocodile Hunter*, *National Geographic for Kids*, etc.)
- What types of animals live in wetlands? (Explore friendly as well as frightening or deadly animals.)

Activity 4

Worried About Wetlands

Purpose: This activity will allow students to further explore negative impressions about wetlands.

Components/Materials:

Worried About Wetlands activity from page 6

Teacher Directions

1. Distribute copies of the *Worried About Wetlands* activity to each Wetland Investigation Team.
2. Have students follow the directions and complete the activity.
3. As a follow-up, ask students how peoples' concerns about wetland animals might affect their general attitudes about wetlands.



What Do You Know About Life in Florida's Wetlands?

Directions: Please decide whether each statement is True or False. Then, use your pencil to darken the appropriate bubble on your answer sheet.

1. The webbed hind feet of bullfrogs are an adaptation that helps them live in freshwater wetlands.
2. There is only one type of wetland in Florida.
3. Florida's freshwater wetlands are unimportant.
4. Each person in Florida can help preserve wetlands.
5. The fewer number of plants and animals we see, the healthier the wetland community.
6. Humans have altered or destroyed many of Florida's wetlands.
7. Alligators have no special adaptations that help them live in a wetland.
8. In the past, many people in Florida thought freshwater wetlands were nasty, mosquito-filled swamps that didn't deserve protection.
9. Wetlands are always flooded.
10. Freshwater wetlands are natural resources that are necessary for the survival of humans and animals.
11. The largest sawgrass marsh in Florida is called the Everglades.
12. Animals need only food and shelter to survive.
13. Wetlands are important to both water quantity and quality.
14. A cypress dome is a type of freshwater wetland found in Florida.
15. Many types of aquatic insects use gills to get oxygen from the water.
16. Wetlands are home to many types of wading birds.
17. Baby dragonflies live in the water.
18. Only male mosquitoes feed on blood.
19. The wide trunks of cypress trees help them survive in a wetland.
20. Humans have changed or destroyed many wetlands in Florida.

What Do You Know About Life in Florida's Wetlands? Answer Sheet

Name: _____ Date: _____

Directions: Bubble-in the correct response for each question.

Pretest		Posttest	
True	False	True	False
1. <input type="radio"/>	<input type="radio"/>	1. <input type="radio"/>	<input type="radio"/>
2. <input type="radio"/>	<input type="radio"/>	2. <input type="radio"/>	<input type="radio"/>
3. <input type="radio"/>	<input type="radio"/>	3. <input type="radio"/>	<input type="radio"/>
4. <input type="radio"/>	<input type="radio"/>	4. <input type="radio"/>	<input type="radio"/>
5. <input type="radio"/>	<input type="radio"/>	5. <input type="radio"/>	<input type="radio"/>
6. <input type="radio"/>	<input type="radio"/>	6. <input type="radio"/>	<input type="radio"/>
7. <input type="radio"/>	<input type="radio"/>	7. <input type="radio"/>	<input type="radio"/>
8. <input type="radio"/>	<input type="radio"/>	8. <input type="radio"/>	<input type="radio"/>
9. <input type="radio"/>	<input type="radio"/>	9. <input type="radio"/>	<input type="radio"/>
10. <input type="radio"/>	<input type="radio"/>	10. <input type="radio"/>	<input type="radio"/>
11. <input type="radio"/>	<input type="radio"/>	11. <input type="radio"/>	<input type="radio"/>
12. <input type="radio"/>	<input type="radio"/>	12. <input type="radio"/>	<input type="radio"/>
13. <input type="radio"/>	<input type="radio"/>	13. <input type="radio"/>	<input type="radio"/>
14. <input type="radio"/>	<input type="radio"/>	14. <input type="radio"/>	<input type="radio"/>
15. <input type="radio"/>	<input type="radio"/>	15. <input type="radio"/>	<input type="radio"/>
16. <input type="radio"/>	<input type="radio"/>	16. <input type="radio"/>	<input type="radio"/>
17. <input type="radio"/>	<input type="radio"/>	17. <input type="radio"/>	<input type="radio"/>
18. <input type="radio"/>	<input type="radio"/>	18. <input type="radio"/>	<input type="radio"/>
19. <input type="radio"/>	<input type="radio"/>	19. <input type="radio"/>	<input type="radio"/>
20. <input type="radio"/>	<input type="radio"/>	20. <input type="radio"/>	<input type="radio"/>



What Do You Know About Life in Florida's Wetlands? Answer Key

1. True
2. False
3. False
4. True
5. False
6. True
7. False
8. True
9. False
10. True
11. True
12. False
13. True
14. True
15. True
16. True
17. True
18. False
19. True
20. True



Lesson 2

What Are Wetlands?

Primary Concept

Wetlands are lands that lie between uplands and aquatic systems, and they are wet all or part of the year.

State Standards

Science:

SC.G.1.2.1, SC.H.1.2.4

Language Arts:

LA.A.1.2.3, LA.A.2.2.1, LA.A.2.2.5

Objective

Students will develop a working knowledge of the definition of wetlands.

Activity 1

What's in a Name?

Purpose: This activity will provide your students with information to help them develop a working definition of wetlands.

Components/Materials

What's in a Name? activity from page 8

Teacher Directions

1. Distribute copies of the *What's in a Name?* activity to students.
2. Have students follow the directions and complete the activity.

Activity 2

What Are Wetlands?

Purpose: This activity will enhance your students' understanding of the definition of wetlands.

Components/Materials

What Are Wetlands? article from page 9;

What Are Wetlands? activity from page 10

Teacher Directions

1. Distribute copies of the *What Are Wetlands?* article to students.
2. Have students either read the article individually or as a class.
3. Distribute copies of the *What Are Wetlands?* activity to students.
4. Have students follow the directions and complete the activity.

Answers

1-U, 2-W, 3-U, 4-W, 5-U, 6-W, 7-W, 8-W, 9-W,

10-Answers should include the idea that wetlands are flooded at least part of the year,

11-Answers should describe wetland soil as dark in color, slick to the touch, low in pH and anaerobic,

12-Answer should stress that plants have adapted to live within the wetland environment

Activity 3

Everglades Internet Search

Purpose: This activity will enhance your students' understanding of the definition of wetlands by having them investigate a real wetland environment.

Components/Materials

Computer with Internet access; art supplies (construction paper, crayons, markers and/or other miscellaneous art supplies as needed)

Teacher Directions

1. Students can complete this task individually or in their Wetland Investigation Teams.
2. Have students conduct Internet research about the Florida Everglades. A few good places to start are www.nps.gov/ever/welcome2.htm, www.florida-everglades.com and www.everglades.national-park.com.
3. Based on what they learned during their research, ask students to use art supplies to create informative brochures about the Florida Everglades.
4. Have students share their brochures with the class.

Vocabulary

The following vocabulary words are introduced in Lesson 2 and can be found in the *Vocabulary List* on page 43. Encourage students to use a dictionary to look up any other words they may not understand.

adaptation

anaerobic

aquatic system

pH

upland

wetland

wetland plant

wetland soil

What's in a Name?

Name: _____

Date: _____

Directions: Review the wetland definitions below. Circle the key words that appear in many of the definitions. List these words under "Key Words." Then put these words together to create your own definition of a wetland.

Wetland Definitions

1. Land that is wet during all or part of the year
2. An area of land that is flooded or saturated with water for part of the year and is located between dry land and open water
3. Land that is saturated with water during the entire year or during certain periods of the year
4. An area of land that is wet for at least part of the year
5. Land that is either flooded or saturated with water at certain times of the year
6. An area that lies between dry uplands and aquatic systems and that is flooded at least part of the year

Key Words



Your Wetland Definition

A wetland is

What Are Wetlands?

There are many different ways to describe **wetlands**. One common definition is “land areas that are soaked or flooded by water for part of the year.” This includes areas like swamps and marshes.

Wetlands are usually found between dry **uplands** that are higher than surrounding lands and **aquatic systems** that are continuously covered by water.

It is important to remember that wetlands are land areas. So the middle of the ocean would not be a wetland. However, for at least part of the year, wetlands do contain water. So the middle of the desert would not be a wetland either.

Because the amount of water in wetlands changes, it is sometimes difficult to determine if an area is actually a wetland. For example, some wetlands contain water for the entire year. The soil in these areas is constantly wet. But some wetlands are wet for only part of the year. During the dry season, the soil may dry out completely.

Luckily, there are other ways to determine if an area is a wetland.

The presence of water gives wetland soils a variety of characteristics not found in upland soils. **Wetland soils** are usually darker in appearance than upland soils. Wetland soils are also made up of smaller pieces of dirt. So while upland soils usually feel grainy like sugar, wetland soils are sticky or slick to the touch.

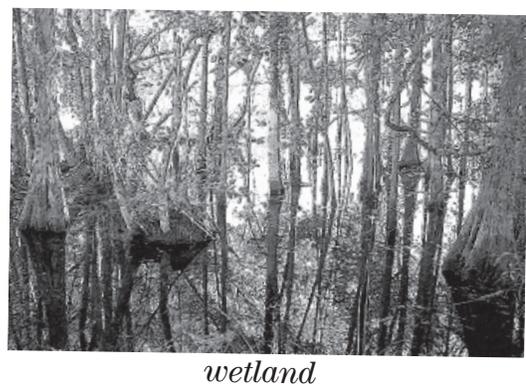
Another feature of many wetland soils is a low pH level. The pH level is used to determine how much acid is in the soil. The lower the pH level, the higher the acidity. Many times, wetland soils have a lower **pH** than upland soils.

Wetland soils are also **anaerobic**. This means that the soils have a low level of oxygen. Upland soils are not usually anaerobic.

Another way to determine if an area is a wetland is by looking at the plants growing in the area. Since wetlands can be covered with water, **wetland plants** have **adaptations** that enable them to grow and survive in soaked or flooded soil.

The roots of most plants would rot if they stayed continuously in soil soaked with water. Wetland plants thrive in these conditions. They have adapted ways to pump oxygen down to the roots. This helps kill the bacteria and fungi in the water that could rot the roots of wetland plants.

Some good examples of wetland plants include cypress trees, willows, ferns and cattails. As you can see, there are many unusual features that make freshwater wetlands some of the most interesting places in Florida.



What Are Wetlands?

Name: _____ Date: _____

Directions: Read the *What Are Wetlands?* article on page 9. Then complete the activity below by placing a “W” next to each characteristic that describes wetlands and a “U” next to each characteristic that describes uplands.

Wetland/Upland

Characteristics

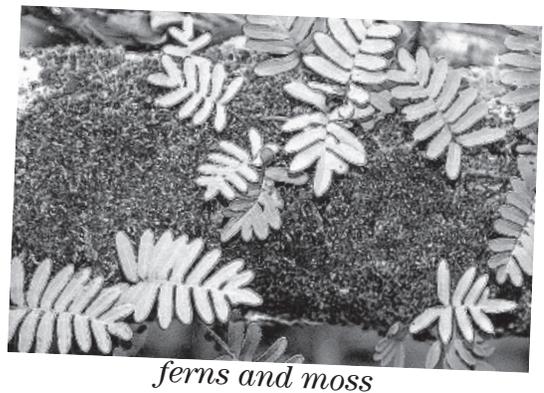
1. Soil usually feels grainy
2. Soil is anaerobic (low in oxygen)
3. Plants die when flooded
4. Plants pump oxygen to their roots
5. Soil is usually light in color
6. Soaked or flooded with water during the year
7. May be found between uplands and bodies of water
8. Soil usually feels sticky or slick
9. Plants can live in flooded conditions

Directions: Write a definition for each of the following words:

10. Wetland: _____

11. Wetland soil: _____

12. Wetland plant: _____



Lesson 3

Types of Freshwater Wetlands

Primary Concept

Geographic factors create a variety of different freshwater wetland communities in Florida.

State Standards

Science:

SC.F.1.2.3, SC.G.1.2.1, SC.G.1.2.2, SC.G.1.2.7, SC.G.2.2.3

Language Arts:

LA.A.2.2.5

Objective

Students will develop a working knowledge of several types of freshwater wetland communities found in Florida.

Activity 1

What Types of Wetlands Are Found in Florida?

Purpose: This activity will provide your students with information to help them develop working knowledge of several types of wetlands found in Florida.

Components/Materials

What Types of Wetlands Are Found in Florida? article from page 12; *What Types of Wetlands Are Found in Florida?* activity from page 15

Teacher Directions

1. Distribute copies of the *What Types of Wetlands Are Found in Florida?* article to students.
2. Have students either read the article individually or as a class.



3. Distribute copies of the *What Types of Wetlands Are Found in Florida?* activity to students.
4. Have students follow the directions and complete the activity.

Answers

Students should use the *What Types of Wetlands Are Found in Florida?* article to provide information on wetlands.

Activity 2

Wetlands Jeopardy

Purpose: This activity will enhance your students' understanding of the different types of wetlands found in Florida.

Components/Materials

Wetlands Jeopardy activity sheet from page 16

Teacher Directions

1. Have students break into their Wetland Investigation Teams.
2. Follow the directions on the *Wetlands Jeopardy* activity sheet from page 16 to play the game.

Vocabulary

The following vocabulary words are introduced in Lesson 3 and can be found in the *Vocabulary List* on page 43. Encourage students to use a dictionary to look up any other words they may not understand.

cattail marsh
cypress dome
cypress knee
flag marsh
hydric hammock
marsh
riverine swamp
sawgrass marsh
stillwater swamp
submersed marsh
swamp
tannin
water lily marsh
wet prairie

What Types of Wetlands Are Found in Florida?

All freshwater wetlands have three things in common. First, they are all soaked or flooded for at least part of the year. Second, they have wetland soils that are usually dark in color, sticky or slippery to the touch, low in pH and anaerobic. And third, wetlands contain plants that are adapted to growing in wet conditions.

But there are also different types of freshwater wetlands, each with their own unique features. In general, wetlands can be separated into two large groups: **swamps** and **marshes**.

Swamps

Freshwater wetlands that feature trees as the major type of vegetation are called swamps. There are many other names for freshwater swamps in Florida including domes, strands, sloughs and heads.

The water in many swamps is shallow and may dry up in the winter. In addition, **tannins** can cause swamp water to appear a dark brown color. Tannins are dark-colored chemicals that are released from tree leaves as they soak in the warm water. This is the same process that occurs when you brew a cup of tea. In addition to coloring the water, tannins can also affect the color of some wetland animals.

The most common trees found in Florida's freshwater swamps are cypress trees. Cypress trees usually grow close together within a swamp. Spanish moss and other air plants hang from their branches. When cypress trees become mature, they are the most flood-tolerant of all wetland trees because of several adaptations.

One adaptation is the development of special structures, called **cypress knees**, that grow up from their roots. These knees have tiny openings that draw in

oxygen to the tree roots under the swamp water. The knees also help break up strong water currents and anchor the trees in the soft muddy soil.

In addition, cypress trees have wide, grooved bases. These wide bases also help break up strong water currents and keep the trees from falling over in the soft mud.

Because of logging operations and storms, there are many tree stumps and fallen trees in swamps that provide excellent resting spots for reptiles and amphibians.

Swamps vary in their size and shape depending on the geology of the area and the source of their water. There are at least five factors that can be used to categorize the different types of swamps:

1. Movement of water during flood season
2. The number of days the swamp is flooded
3. How often the swamp catches fire
4. The variety and amount of organic material in the swamp
5. The source of the swamp's water

One common way to categorize swamps is to determine the movement of the water. Using this method, there are two types of swamps in Florida: **riverine** and **stillwater**.

Riverine Swamps

Riverine swamps have flowing water within them. This type of swamp community borders rivers, streams and spring runs. It has a broad valley and is thickly populated with trees. Because these swamps have so much water, they are home to a wide variety of vegetation.

Riverine swamps have both high productivity and high biological diversity. Riverine swamp communities consist of the river, the floodplain and the ground surrounding the floodplain.

Trees common in riverine swamps include cypress trees, cabbage palms, water ashes, American elms and water locusts. In addition, these swamps are



Photo Credit: Mike Mullins

cypress base

riverine swamp

ideal for waterfowl and water-adapted reptiles and mammals.

Many species of wading birds probe the shallow edges of riverine swamps searching for prey. White ibises are common, as are great blue herons, common egrets and limpkins. A sharp eye may even spot small green-backed herons perched on cypress knees waiting to catch unsuspecting mosquitofish.

Wildlife will often use riverine swamps as travel lanes to move between habitats while avoiding areas populated by humans.

Stillwater Swamps

Stillwater swamps have water that rises and falls with little or no flow. A common kind of stillwater swamp is the **cypress dome**. The cypress dome community forms in a shallow depression in the land. This depression is usually circular and many times is caused by a sinkhole. Cypress domes are frequently surrounded by pinewoods and other uplands.

Water from the surrounding uplands seeps through the sand into the cypress dome depression during the rainy season. The depression continues to hold water into the dry season, creating a stillwater swamp area.

Cypress trees thrive in this environment. The tallest cypress trees grow near the center of the depression and the height of the trees decreases toward the edges, creating a dome-shaped appearance. Common plants within the cypress dome include wax myrtle, swamp laurel oak, pickerelweed, cinnamon fern and royal fern.

Cypress domes have relatively low productivity and biological diversity compared to riverine swamps. Decomposing plant leaves and wind flow blocked



Photo Credit: Mike Mullins

by the outer cypress trees contribute to a low oxygen level in the water. In addition, water in cypress domes usually has a low pH level.

While much wildlife cannot tolerate the low oxygen and low pH of cypress domes, these conditions are ideal for crayfish,

aquatic insect larvae and frogs.

Hydric Hammocks

Hydric hammocks are special because each one can be categorized as either a riverine or stillwater swamp depending on its water flow.

Hydric hammocks are the driest of the swamp wetlands. They are usually flooded for only a short period of time each rainy season. In fact, it is sometimes difficult to tell that these areas are indeed wetlands since they are dry much of the time. However, if you look closely, you can spot watermarks and lichen lines on the trees caused by high water.

Hydric hammocks are home to a variety of trees including sweet bays, cabbage palms and several species of oaks and maples. In central Florida, laurel oaks are the most common trees in hydric hammock communities.

Hydric hammocks are usually located between wetter riverine or stillwater swamps and the edge of flatwoods or other upland forests. Because hydric hammocks are both wet and dry, they are used by a variety of both wetland and upland animals, including wild turkeys, red-shouldered hawks, black bears, opossums, bobcats and raccoons.

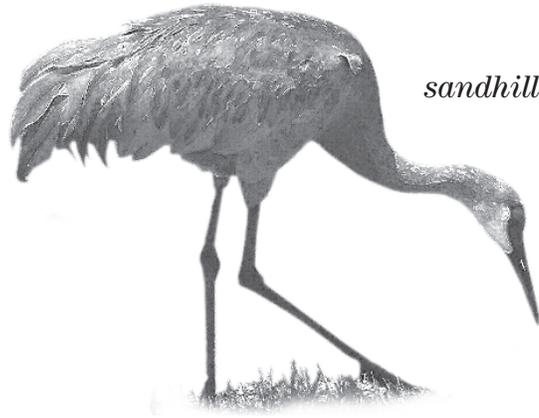
Marshes

Marshes are the second type of freshwater wetland found in Florida. Unlike swamps, marshes have very few trees. Most of the vegetation in marshes consists of grasses, sedges, rushes and other soft-stemmed plants, along with scattered woody



Photo Credit: Mike Mullins

cypress dome



sandhill crane

shrubs. Nearly one-third of the wetlands in Florida are considered marshes.

Marshes can be categorized by determining the dominant plants found in the marsh. Marsh types based on vegetation include water lily marshes, cattail marshes, sawgrass marshes, flag marshes, submersed marshes and wet prairies.

Water lily, cattail and sawgrass marshes are named for the most abundant plants found in the marsh. For example, marshes that contain mostly water lilies are considered water lily marshes. The largest marsh in Florida is a sawgrass marsh. We call this incredible sawgrass marsh the Everglades.

Flag marshes are dominated by plants with flaglike leaves, such as pickerelweeds, fire flags and arrowheads.

Submersed marshes have a fewer number of plants than other marshes. However, the water in submersed marshes is generally deeper than other marshes (3 to 4 feet deep). Scientists sometimes refer to ponds as submersed marshes.

Wet prairies are generally the least frequently flooded of all Florida marshes. However, wet prairies are home to a large variety of plant life including grasses, sedges and flowering plants.

All the different types of marshes provide food, protection and breeding sites for a wide variety of wildlife. Turtles, alligators, waterfowl, otters, raccoons, deer and many other animals utilize the unique habitats found in marshes.



hydric hammock

Photo Credit: Mike Mullins

What Types of Wetlands Are Found in Florida?

Name: _____ Date: _____

Directions: Read the *What Types of Wetlands Are Found in Florida?* article. Choose from the types of wetlands below to fill in the blanks.

Types of Wetlands

- riverine swamp
- stillwater swamp
- cypress dome
- hydric hammock
- water lily marsh
- cattail marsh
- sawgrass marsh
- flag marsh
- submersed marsh
- wet prairie



Description

1. A _____ is a type of wetland that

2. A _____ is a kind of wetland that

Compare and Contrast

1. A _____ and a _____ are similar because they both _____

2. A _____ and a _____ are different because _____

Answers & Questions

Wetlands Jeopardy

Directions: Read the first “answer” below to your students. The first team that raises their hands gets to provide the “question.” Their response MUST be in the form of a question! If the team provides the wrong “question,” they lose one point. The remaining teams can then raise their hands again to try to provide the correct “question.” The team that provides the correct “question” gets one point. The team with the most points after all “answers” are read is the winner.

Answer: Trees are the major type of vegetation in this kind of wetland.

Question: What is a swamp?

Answer: These chemicals cause swamp water to appear a dark brown color.

Question: What are tannins?

Answer: This type of marsh has fewer plants but deeper water than other marshes.

Question: What is a submersed marsh?

Answer: A type of riverine or stillwater swamp that is used by a wide variety of both wetland and upland animals.

Question: What is a hydric hammock?

Answer: The two types of swamps in Florida.

Question: What are riverine and stillwater swamps?

Answer: This type of marsh is dominated by pickerelweeds, fire flags and arrowheads.

Question: What is a flag marsh?

Answer: Common trees in this type of swamp include cypress trees, cabbage palms, water ashes, American elms and water locusts.

Question: What is a riverine swamp?

Answer: Two common types of stillwater swamps.

Question: What are cypress domes and hydric hammocks?

Answer: Special structures that grow up from the roots of cypress trees to provide oxygen and stability.

Question: What are cypress knees?

Answer: A swamp community that has water that rises and falls with little or no flow.

Question: What is a stillwater swamp?

Answer: One of the three marshes named after the most abundant plants found within them.

Question: What is a water lily marsh? OR What is a cattail marsh? OR What is a sawgrass marsh? (For a bonus, you can ask students to provide you with all three types of marshes.)

Answer: A swamp community that has flowing water and usually borders rivers, streams and spring runs.

Question: What is a riverine swamp?

Answer: The Everglades is the largest of this kind of marsh in Florida.

Question: What is a sawgrass marsh?

Answer: A type of freshwater wetland that has grasses, sedges, rushes and other soft-stemmed plants, but very few trees.

Question: What is a marsh?

Answer: This type of stillwater swamp has relatively low productivity and biological diversity.

Question: What is a cypress dome?

Answer: The least frequently flooded marsh in Florida, but with a large variety of plant life.

Question: What is a wet prairie?

Lesson 4

Who Lives in Wetlands?

Primary Concept

Many animals have special adaptations that make them suited for living in wetlands.

State Standards

Science: SC.F.1.2.3, SC.G.1.2.1, SC.G.1.2.2, SC.G.1.2.7, SC.G.2.2.3

Language Arts: LA.A.2.2.5

Objective

Students will develop a working knowledge of several animals that live within Florida's freshwater wetland communities. Students will be able to describe common wetland animals and understand some adaptations for living within wetlands.

Activity 1

Living Without a Backbone

Purpose: This activity will provide your students with information to help them develop working knowledge of invertebrates found in Florida's wetlands.

Components/Materials

Living Without a Backbone article from page 19; *Invertebrate Match* activity from page 23

Teacher Directions

1. Distribute copies of the *Living Without a Backbone* article to students.
2. Have students either read the article individually or as a class.
3. Distribute copies of the *Invertebrate Match* activity to students.
4. Have students follow the directions and complete the activity.

Answers

1-scud, 2-dragonfly nymph, 3-six-spotted fisher spider, 4-damselfly nymph, 5-mosquito larva, 6-damselfly adult, 7-predaceous diving beetle adult, 8-giant water bug, 9-dragonfly adult, 10-water scorpion, 11-male Belostoma water bug (with eggs), 12-water boatman, 13-mosquito pupa, 14-predaceous diving beetle larva, 15-water strider, 16-crayfish

Activity 2

A Bird's-Eye View of Wetlands

Purpose: This activity will provide your students with information to help them develop a working knowledge of birds found in Florida's wetlands.

Components/Materials

A Bird's-Eye View of Wetlands article from page 24; *Bird Tools* activity from page 26

Teacher Directions

1. Distribute copies of the *A Bird's-Eye View of Wetlands* article to students.
2. Have students either read the article individually or as a class.
3. Distribute copies of the *Bird Tools* activity to students.
4. Have students follow the directions and complete the activity.

Answers

red-shouldered hawk = tears out chunks of meat;
white ibis = probes mud for aquatic insects and fish;
great blue heron = spears prey;
limpkin = opens shells of mussels and apple snails;
roseate spoonbill = sweeps through water and snaps down on prey

Activity 3

Reptiles, Amphibians and Fish... Oh, My!

Purpose: This activity will provide your students with information to help them develop working knowledge of reptiles, amphibians and fish found in Florida's wetlands.

Components/Materials

Reptiles, Amphibians and Fish... Oh, My! article from page 27; *Reptiles, Amphibians and Fish... Oh, My!* activity from page 29; additional reference materials or Internet access

Teacher Directions

1. Distribute copies of the *Reptiles, Amphibians and Fish... Oh, My!* article to students.
2. Have students either read the article individually or as a class.

3. Distribute copies of the *Reptiles, Amphibians and Fish... Oh, My!* activity to students. For this activity, have additional reference materials or Internet access available for research.
4. Have students follow the directions and complete the activity.

Vocabulary

The following vocabulary words are introduced in Lesson 4 and can be found in the *Vocabulary List* on page 43. Encourage students to use a dictionary to look up any other words they may not understand.

abdomen	mollusk
air storage area	nonvenomous
amphibian	nymph
arachnid	omnivore
bird of prey	piercing beak
calcium carbonate	predator
carnivore	proboscis
cold-blooded	pupa
complete metamorphosis	raptor
crustacean	reptile
decomposer	spiracle
exoskeleton	swimming bird
fish	thorax
gill	trachea
incomplete metamorphosis	true bug
insect	venom
invertebrate	venomous
keel	vertebrate
labium	visceral mass
larva	wading bird
metamorphosis	

Living Without a Backbone

The most abundant animals in Florida's freshwater wetlands are **invertebrates**. Invertebrates are animals that do not have backbones. Their skeleton is on the outside of their bodies. This outside skeleton is called an **exoskeleton** and is something like a jointed suit of armor.

Invertebrates rely on exoskeletons to protect their internal parts. Exoskeletons are waterproof and keep invertebrates from drying out. In addition, exoskeletons provide a place for invertebrates' muscles to attach.

There are many types of invertebrates found in Florida's wetlands. Some of the most common types are **insects**, **crustaceans**, **arachnids** and **mollusks**.

Insects

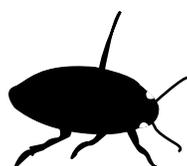
Insects are by far the most numerous invertebrates found in wetlands. Many times people use the term "bug" when talking about all insects. In fact, **true bugs** are special types of insects that have sucking mouthparts and two pair of wings. So, while all bugs are insects, not all insects are bugs!

Insects are invertebrates with six legs and three main body parts, called segments. The first segment is the head and contains the eyes, antennae and mouthparts. The middle segment, called the **thorax**, has three pair of legs. Most insects also have one or two pair of wings at the thorax. The last segment, called the **abdomen**, contains the digestive and reproductive organs.

As insects reach adulthood, they develop by changing form. This process is called **metamorphosis**. Most insects go through a four-stage metamorphosis called a **complete metamorphosis**.

In the first stage, the female lays eggs. For the second stage, the eggs hatch into

adult dragonfly



predaceous diving beetle



water boatman



water scorpion

larvae. The larvae are usually worm-shaped and do not look like the adult insect. The third stage is the **pupa** stage. In this stage, the larvae will enclose themselves in a cell or cocoon without food. Inside the cell, their bodies develop in a process that lasts anywhere from four days to many months. During the final stage, the larvae emerge from the pupae as adults.

Some insects, like dragonflies and damselflies, have an **incomplete metamorphosis**. They do not have larva or pupa stages. Instead, the eggs hatch into **nymphs**. Nymphs usually look like a smaller version of the adult insect without wings.

Insects Are a Success!

Insects are the most successful animals on the planet. There are more species of insects than there are species of all other animals combined. There are at least four reasons why insects are so successful.

The first reason is that most insects can fly. Some insects fly great distances in search of food or habitat. When a wetland dries up, many aquatic insects fly away to find another wet area. Flying also helps them escape from predators.

The second reason for the success of insects is the great variety in the diet and other living requirements needed for the various insect species. This is especially true of aquatic insects.

For example, highly specialized mouthparts allow different insects to eat different foods — even when they live in the same space. Some insects need just a few cubic centimeters of water or soil for their habitat. Others live on or in the egg or body of a single animal. These adaptations allow many different insect species to live together in a small environment without competing for food or living space.

The third reason is their exoskeleton. The exoskeleton provides excellent protection from predators and harsh weather conditions.

The fourth reason for the success of insects is that they have a high reproductive rate and a short life cycle. For example, a single female can lay hundreds of eggs at a time. The eggs develop rapidly and produce millions of offspring during the course of a year. In addition to producing vast numbers, this adaptation also increases the ability of insects to adapt to changing environments.

How Do Aquatic Insects Breathe?

Many insects within Florida's wetlands are aquatic for at least part of their life cycle. Some are aquatic for their whole lives. Insects have developed a variety of adaptations to help them get oxygen while they are underwater.

One common adaptation is breathing pores called **spiracles**. Some adult beetles and nymphs move to the surface of the water to allow their spiracles to come in contact with the air. This lets oxygen into their body before diving again.

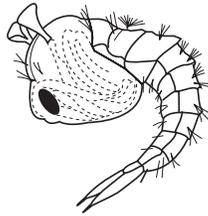
Other aquatic insects utilize a breathing tube called a **trachea**. This is like a snorkel attached to their abdomen. Insects can stick the trachea above the surface of the water to breathe air.

The larva stage of flies and the larva and pupa stages of some mosquitoes use tracheas. Adult water scorpions also use a pair of trachea located at the base of their abdomens.

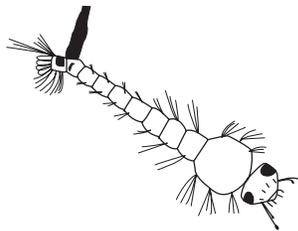
Some insects use **air storage areas** under their wings or on various parts of their bodies to trap air and bring it under the water. These air storage areas are located next to the spiracles. This is common in adult true bugs such as water boatmen and various aquatic beetles.



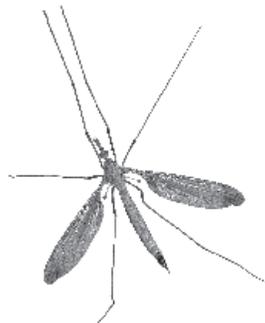
beetle larva



mosquito pupa



mosquito larva with trachea



adult mosquito



dragonfly nymph

Several beetles, such as the predaceous diving beetle, use the numerous hairs on their legs to trap an air bubble and hold it against their spiracles. This allows the insects to receive oxygen from the trapped air while they are underwater, similar to scuba divers who wear air tanks.

Many types of larvae and nymphs possess special organs called **gills** that allow them to breathe underwater. Although the gills can be any size or shape, they are usually found on the thorax or abdomen segments of insects. To ensure that an adequate supply of oxygen moves over their gills, insects rely on water currents and use internal muscles to move their gills back and forth.

Stonefly and mayfly nymphs are both good examples of insects with gills. The larva stage of some mosquitoes also has gills.

Slim damselfly nymphs possess three leaf-shaped gills at the tip of their abdomen.

The larvae of some predaceous diving beetles have gills that resemble thin wings on the last segment of their abdomens.

Dragonfly nymphs have internal gills that are located in a chamber in their abdomen. This breathing style has an added bonus. A dragonfly nymph can jet along underwater by forcefully squirting water out of its abdominal opening.

How Do Aquatic Insects Feed?

Aquatic insects use a variety of ways to feed on a wide range of different diets. Looking at the food an insect eats is often a major aid in locating and identifying a specific species. In many aquatic insect species the adults and the young feed on different foods.

Some of the most common wetland insects are mosquitoes. Mosquito larvae eat microscopic plants, animals and organic debris that are filtered through brushes that surround their mouths.

Adult mosquitoes have a piercing, sucking mouthpart called a **proboscis**. Male mosquitoes feed on the nectar of flowers. Only the females are bloodsuckers. Many types of mosquitoes require a meal of blood before they are able to lay their eggs. Sometimes you are the victim of this need for blood!

Many aquatic insects use a combination of grasping front legs and a **piercing beak** to kill and eat their prey. They squirt saliva into their prey through their beaks. The saliva digests the soft inner tissue of the prey. The fluid is then sucked out of the prey's body.

Some examples of insects that feed this way are water scorpions, predaceous diving beetles, Belostoma water bugs and giant water bugs.

Dragonfly and damselfly nymphs have large extendable jaws covered by a scooplike lip called a **labrum**. Both feed on insect larvae, worms, small crustaceans, tadpoles or even small fish. Dragonfly and damselfly nymphs are an important food for many larger fish, making them an integral part of the food chain.

Adult dragonflies and damselflies are also commonly seen in wetlands. Both eat other flying insects that they capture during flight. In fact, dragonflies eat lots of adult mosquitoes.

True bugs, such as water boatmen and water striders, have mouthparts fitted for piercing and sucking.

Adult water boatmen feed on algae, or on decaying plant and animal matter that they suck from the bottom of the wetland.



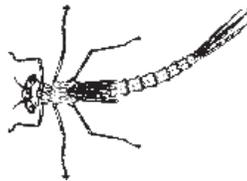
dragonfly



giant water bug



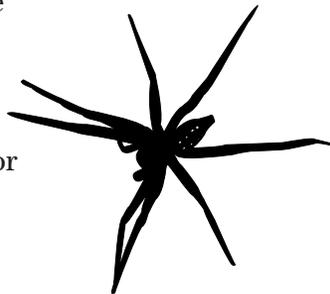
scud



damselfly nymph



damselfly



six-spotted fisher spider

Water striders live on the surface film of the water. From their perch, they catch other insects or small crustaceans just beneath the water's surface.

Crustaceans

Crustaceans are characterized by a hard exoskeleton, jointed legs and segmented bodies. They are closely related to insects.

The most easily observable crustaceans in wetlands are crayfish. Crayfish resemble miniature lobsters and feed on both dead and weak small animals.

When wetlands begin to dry out, crayfish burrow into the ground. They pile up mud around the holes to form chimneys. Crayfish holes go down to the water table beneath the surface so it fills with water, keeping them moist. These wet homes also provide habitats for other wetland species until the rains once again fill the wetlands.

Scuds are small crustaceans that look like shrimp and live on the edge of wetlands. They are **decomposers**. This means they eat dead plant material and expel the nutrients. Plants then use these nutrients as a natural fertilizer.

Arachnids

A variety of arachnids also live in Florida's wetlands. Arachnids are related to insects, but differ because they usually have only two body segments instead of three, and eight legs instead of six. The most common arachnids in Florida's wetlands are spiders.

Argiope spiders, commonly called garden orbweavers, build large, strong webs in trees to catch flying insects.

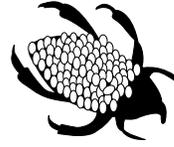
Six-spotted fisher spiders walk on the surface of the water. When they spy small fish, they dive beneath the surface. Like some insects, six-spotted fisher spiders carry an air bubble with them to breathe underwater while chasing fish.

Mollusks

Wetlands located along the edges of rivers, streams or large lakes often serve as habitat for mollusks such as snails, clams and mussels.

Mollusks usually have shells that provide protection. These invertebrates secrete **calcium carbonate** to use in creating their own shells.

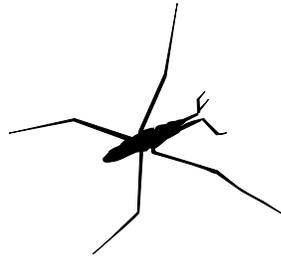
Mollusks' bodies are divided into three regions: the head, the foot (which provides movement) and the **visceral mass** (which is where the organs are located).



*male Belostoma water bug
(with eggs)*



apple snail



water strider



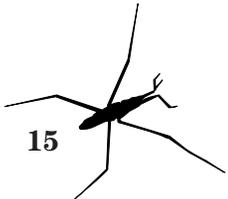
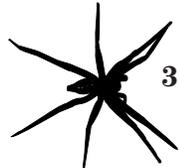
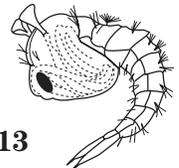
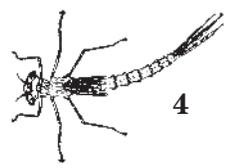
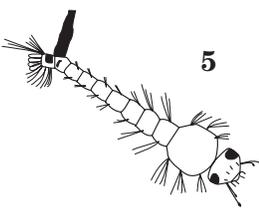
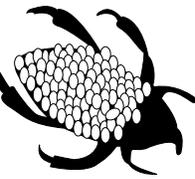
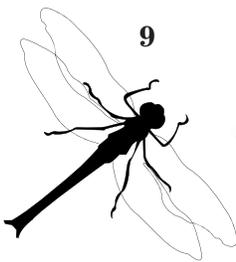
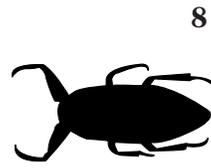
crayfish

Invertebrate Match

Name: _____

Date: _____

Directions: Read the *Living Without a Backbone* article. Match the invertebrates by writing the correct number in the blanks.

1 	16 	15 
2 	___ Scud ___ Dragonfly Nymph	14 
3 	___ Damselfly Adult ___ Crayfish ___ Predaceous Diving Beetle Larva	13 
4 	___ Male Belostoma Water Bug (with eggs) ___ Predaceous Diving Beetle Adult	12 
5 	___ Water Scorpion ___ Damselfly Nymph ___ Giant Water Bug	11 
6 	___ Water Boatman ___ Water Strider ___ Mosquito Pupa	9 
7 	___ Mosquito Pupa ___ Mosquito Larva ___ Dragonfly Adult ___ Six-Spotted Fisher Spider	10 
8 		

A Birds-Eye View of Wetlands

Wetlands are home to many types of birds. The combination of wet and dry conditions and the abundance of prey make the wetlands a great habitat for birds. **Wading birds** prowl the shores in search for food, **swimming birds** hunt in deeper water and **birds of prey** lurk in the trees using their keen sight to spy a meal below.

Wading Birds

The term *wading birds* describes a group of birds that have long legs and large feet to walk through shallow water hunting for their food. All wading birds are **carnivores**. This means they eat other animals including fish, aquatic insects and other invertebrates, amphibians, reptiles and even smaller birds.

Egrets and herons are wading birds equipped with spearlike beaks. They have a long powerful neck that enables them to whip their beak forward at a tremendous speed to spear prey.

The largest birds in this group are great blue herons. They stand over four feet tall and have very long legs that allow them to wade in deeper water. Great blue herons eat anything from medium-sized fish to baby alligators.

Great egrets are large white wading birds that get almost as large as great blue herons. However, they hunt the shallow for smaller prey including small fish and aquatic insects. Great egrets also search aquatic vegetation for grasshoppers.

Several smaller herons and egrets are found in the wetlands, including little blue herons, tri-colored herons, snowy egrets, green-backed herons and night herons.

In the wetlands you'll also find three species of wading birds with curved beaks. The most common

of these are white ibises. These birds use their curved red beak to probe the mud for fish and aquatic insects. They are often seen feeding in groups. Immature white ibises have brown feathers on their backs and wings.

Limpkins look like large ibises, but with brown coloring. They use their curved beaks like a can opener to cut open the shells of apple snails and mussels.

The third species of curved-beaked birds are wood storks. They are the largest wading birds with a curved beak. Their featherless, black heads and white feathers make this endangered species easy to recognize.

Wood storks feed by touch. They walk through the water with their beaks open. When a fish comes into contact with their beak, it snaps shut.

Many people consider roseate spoonbills the most beautiful wading birds. They are bright pink and sweep their spoon-shaped bill through the water from side to side. The sensitive beak snaps shut when it comes into contact with shrimp, aquatic insects and small fish.

Swimming Birds

There are several types of swimming birds in wetlands. Most swimming birds have webbed feet that help them paddle quickly through the water.

Wetlands are home to several types of ducks. Ducks are usually **omnivores**, which means they eat both plants and animals.

great blue heron



great egret



night heron



limpkin



white ibis

mottled duck



Two other common swimming birds are fish eaters. Both cormorants and anhingas are black birds that swim after medium-sized fish. At a distance, it is sometimes hard to tell these two birds apart, but there are differences to the trained eye.

Cormorants have a small hook at the end of their short bill, while anhingas have a long, straight spearing bill. Both birds can be seen sitting in trees with their wings spread. Unlike ducks, these birds only have a small amount of waterproofing oil on their feathers. Therefore, they must sun-dry their feathers after swimming through the water.

Birds of Prey

Several birds of prey live in wetlands. Birds of prey, also called **raptors**, have long, curved talons to catch and kill prey. They also have sharply hooked beaks for tearing meat. Some common wetland raptors include hawks, owls, eagles and ospreys.

Red-shouldered hawks are the most common hawks in central Florida wetlands. Their compact body makes it easy for them to fly among the numerous trees found in wetlands.

Red-shouldered hawks feed on small reptiles, such as lizards and insects. They often sit on tree limbs waiting for their prey to move. They then drop down on the hapless victim, pinning their prey with the sharp talons on their feet.

Barred owls hunt prey similar to that of red-shouldered hawks. However, these two species do not compete for food because hawks hunt during the day and owls hunt at night.

The two fish-eating birds of prey are the osprey and the bald eagle. They both can snatch fish at the surface of the water with their talons.

anhinga



cormorant



barred owl



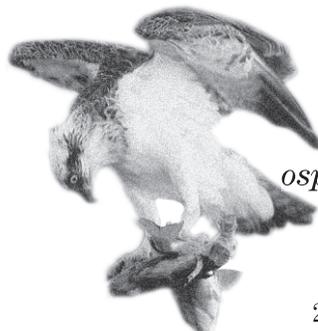
wood stork



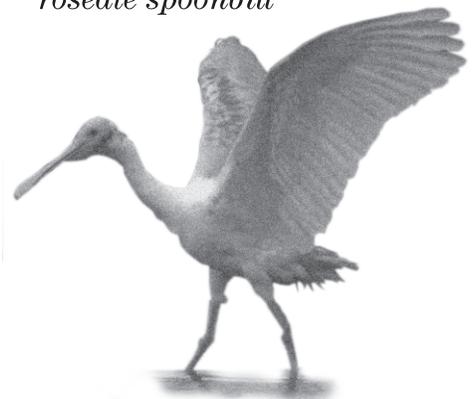
red-shouldered hawk



osprey



roseate spoonbill



Bird Tools



Name: _____ Date: _____

Directions: Birds use their beaks in the same way humans use tools. Read the *A Bird's-Eye View of Wetlands* article and then look at the beaks of the birds pictured below. Complete the table by either filling in the name of the bird or the function of the bird's beak.

Bird Name	Bird Beak	Beak Function
red-shouldered hawk		tears out chunks of meat
		probes mud for aquatic insects and fish
great blue heron		
		opens shells of mussels and apple snails
roseate spoonbill		



Reptiles, Amphibians and Fish... Oh, My!

Florida's freshwater wetlands are home to a variety of **reptiles, amphibians** and **fish**. While there are many differences between these animals, there are some things they have in common.

First of all, they are **cold-blooded**. This means they have no internal heat and must rely on the sun for warmth. Second, these animals are called **vertebrates** because they have backbones. And third, reptiles, amphibians and fish have all developed unique adaptations to help them live in wetlands.

Reptiles

Reptiles are vertebrates with scaly skin that keeps their bodies from drying out. In addition, their young look like small versions of the adults and do not go through a metamorphosis like amphibians.

The most spectacular and largest of the reptiles are alligators. These wetland residents are experts at hunting and killing their prey, making them highly efficient **predators**.

Their size, speed and power put them at the top of the wetland food chain.

Alligators have many adaptations for life in the wetlands. They are able to swim rapidly with their powerful tails or very slowly with their webbed hind feet.

Both the nostrils and eyes are on the top of alligators' heads so they can swim with most of their body under the water.

Alligators are important to wetlands because they dig holes that go down to the water table. During the dry season, these holes stay wet and provide water for many wetland organisms. This practice also ensures the alligators of a food supply, as they eat some of the animals who come to drink.

Another group of predatory reptiles commonly found in wetlands are water snakes. They all have ridges called **keels** on their scales to help them swim. Like alligators, water snakes' nostrils are up near the top of their snouts to allow them to breathe while swimming with their heads just above water. Although most reptiles lay eggs, most water snakes bear their young live.

The best known water snakes in Florida's wetlands are cottonmouth water moccasins. They are named for their habit of opening their white mouth when threatened. Cottonmouth water moccasins are called **venomous**

because they have hollow fangs that can inject **venom** when they bite. Venom is a modified form of saliva that can kill prey.

Other water snakes commonly seen in wetlands include brown water snakes and Florida water snakes. These snakes are considered **nonvenomous** because they do not have venom.

Cottonmouths, as well as brown and Florida water snakes, primarily feed on fish, but they also eat frogs, mice and lizards. All of these snakes may be seen sunning themselves on logs or branches in the wetlands.

Other water snakes, such as mud snakes and striped crayfish snakes, are more specialized in their diets. Mud snakes feed almost exclusively on salamanders, while striped crayfish snakes only feed on crayfish and dragonfly nymphs.

These nonvenomous snakes are seldom seen, as they hide in thick vegetation and don't bask in the sun.

Other types of nonvenomous snakes found in wetlands include black racers, garter snakes and keeled green snakes.

cottonmouth

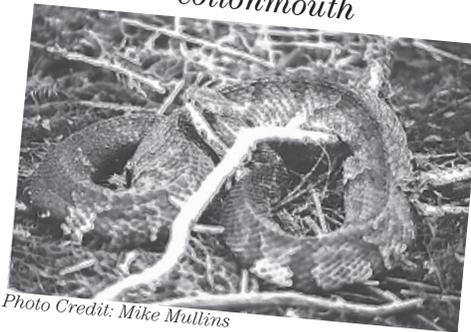


Photo Credit: Mike Mullins

alligator

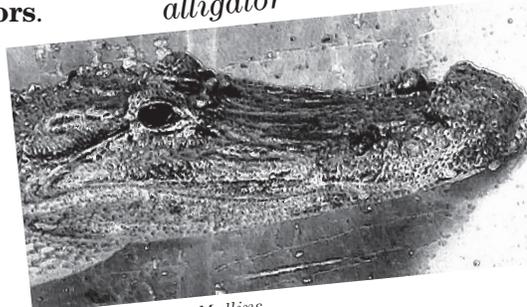


Photo Credit: Mike Mullins

Florida water snake

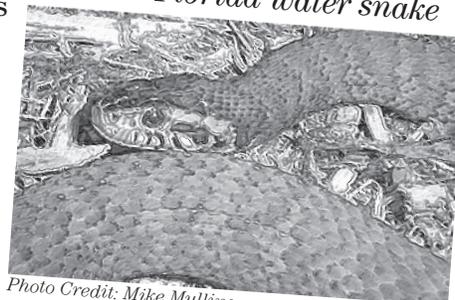


Photo Credit: Mike Mullins

Turtles are another type of reptile found in wetlands. Red-bellied sliders are the most common. These turtles get their name from their habit of sliding off a log when danger approaches. The sliders found in Florida wetlands have thick shells to help protect them from being eaten by alligators.

Other common turtles in the wetlands are peninsular cooters, musk turtles and common snappers. A musk turtle is small with a dome-shaped shell. Snapping turtles are seldom seen because they spend most of their time on the bottom of swamps and marshes.

Some turtles, such as snappers, eat fish and amphibians. Others, such as sliders, eat aquatic plants.

Amphibians

Amphibians are very dependent on healthy wetlands. These vertebrates live part of their lives on land and part of their lives in water.

Amphibians lay their eggs in jellylike masses that have to remain wet. Their young usually go through a metamorphosis before reaching adulthood. Most adult amphibians need to keep their skin moist to absorb oxygen while underwater.

The most common amphibians in Florida's freshwater wetlands are frogs. These include the small tree frogs as well as the larger bullfrogs and pig frogs. Large frogs have webbed feet that make them excellent swimmers.

Frogs hatch from eggs as tadpoles before going through metamorphosis to become adult frogs. Sometimes thousands of tadpoles blacken the shallows in riverine swamps, marshes and temporary pools in hydric hammocks.

Two other types of amphibians found in Florida's wetlands are sirens and salamanders. Sirens are eel-like creatures and salamanders look like slick lizards.

pig frog



Photo Credit: Mike Mullins

Fish

Fish are vertebrates that have gills that allow them to breathe underwater. Fish make their way into wetlands when they are flooded.

The most common type of wetland fish are mosquitofish. True to their name, these small fish feed on the larvae and pupae of mosquitoes, as well

as other small aquatic insects. Other small fish found in wetlands include mollies, killifish and darters.

Sunfish and their larger cousins, bass, use the wetlands as a nursery ground. The juvenile fish hide among the wetland plants to avoid predators.

red-bellied slider turtle



Photo Credit: Mike Mullins

Reptiles, Amphibians and Fish... Oh, My!

Name: _____ Date: _____

Directions: Read the *Reptiles, Amphibians and Fish... Oh, My!* article. Complete the table below by writing the adaptations each animal uses for living in wetlands.

Animal	Adaptations for Living in Wetlands
alligators	
water snakes	
turtles	
frogs	
fish	

Directions: Do some additional research on one wetland reptile, amphibian or fish. List some things you learned in the space below.

Animal: _____

What I Learned: _____



tree frog



mosquitofish



bullfrog's webbed hind foot



bullfrog

Lesson 5

Investigating a Wetland

Primary Concept

Investigating a wetland requires careful observation and special skills.

State Standards

Science:

SC.F.1.2.3, SC.G.1.2.1, SC.G.1.2.2, SC.G.1.2.7, SC.G.2.2.3

Objective

Students will develop a working knowledge of methods used to observe animals in their natural habitats. Students will understand how their behavior may affect their ability to see animals. Students will be able to describe how their time will be allocated on their wetland field study.

Activity 1

What Might We See?

Purpose: This activity will allow your students to organize the information they have learned in preparation for a wetland field study.

Components/Materials

Chart paper

Teacher Directions

1. Break up students into their Wetland Investigation Teams.
2. Explain to your students that they will be conducting a field study of a freshwater wetland community. They will be observing wetland animals and recording what they see on data sheets.
3. Pass out chart paper to each team.
4. Ask each team what they might see during their field study and have them record their answers on the chart paper.
5. Post the results in class and go over the answers. You can expand on the posted results by asking the following questions to the entire class:
 - What other animals would you expect to see?
 - Where do you think they would live?
 - What type of adaptations do they have to live in wetlands?

Activity 2

How to Observe Small Aquatic Animals

Purpose: This activity will provide your students with knowledge that will allow them to observe small aquatic animals during their field study.

Teacher Directions

1. Explain to your students that many of the organisms that live in the water environments of wetlands are small aquatic insects and other water creatures fewer than three centimeters in length. These small animals have to avoid being easily seen by predators. They use camouflage to avoid detection. These animals are often dark reddish-brown to hide in dead leaves.
2. Ask your students the following questions:
 - How would camouflage make these animals more difficult to find and observe?
 - How would we observe these creatures?
3. Steer the discussion toward collecting the organisms with dip nets, placing them in pans and then observing them with hand lenses.

Activity 3

How to Observe Larger Wetland Animals

Purpose: This activity will provide your students with knowledge and skills that will allow them to observe large wetland animals during their field study.

Components/Materials

Binoculars or toilet paper/paper towel rolls for making practice binoculars

Teacher Directions

1. Explain to your students that wetland animals are easily frightened by humans. They may also be hidden among the plants or in the trees. In some cases, they will be a long distance away.
2. Ask your students what ideas they have that might increase their success at spotting large wetland animals during a field study.
3. Steer the discussion toward the students moving silently and keeping their voices low to avoid scaring the animals. Also, binoculars could be used to spot creatures that are far away.

4. Have students practice using binoculars by focusing on objects inside and outside the classroom. If binoculars are not available, you can use toilet paper or paper towel rolls as practice binoculars. Students can also use their hands as makeshift binoculars.

Activity 4

Field Study Agenda

Purpose: This activity will inform your students about what they will be doing on their field study and how to prepare for the trip.

Components/Materials

Field Study Agenda from page 32

Teacher Directions

1. Explain to your students that for their field study they should dress appropriately. They should wear long pants and tennis shoes, or other closed-toed shoes that they can get wet. Hats, sunglasses, sunscreen and insect repellent are also good ideas.
2. Discuss with your students what they will need to do about lunches. This will depend on your specific trip plan, but usually students should bring bagged lunches that do not require refrigeration.
3. Tell your students that they must use their best school manners during the field study. In addition, they are NEVER to leave any paper or other trash in the wetlands.
4. Distribute copies of the *Field Study Agenda* to students.
5. Place the Wetland Investigation Teams into two larger "Activity Groups."
6. Go over the *Field Study Agenda*. Allow students time to discuss the agenda and ask questions.

Activity 5

The Field Study

Purpose: This activity will allow students to put all their previous knowledge to use. Students will collect and observe wetland animals and record their results.

Components/Materials

Teacher Field Study Checklist from page 33; *Field*

Study Agenda from page 32; *Freshwater Wetlands Data Sheet* from page 34; clipboards (or other portable writing surface); pencils; observation equipment (binoculars, dip nets, observation pans and hand lenses)

Teacher Directions

1. Plan your trip carefully. Use the *Teacher Field Study Checklist* as a guide.
2. Review the *Field Study Agenda* with your students and chaperones before boarding the buses.
3. At the site, discuss the collecting experience with chaperones so they are familiar with their roles.
4. Remind your students which activity group they are in.
5. Have each activity group nominate one person to record their data. Distribute copies of the *Freshwater Wetlands Data Sheet*, clipboards and pencils to each group's recorder.
6. Instruct students to place a mark next to each animal listed on the data sheet that the group observes. If they observe the same animal more than once, then they should place additional marks next to that animal.
7. Distribute the appropriate observation equipment to students depending on if they are observing small aquatic animals or larger animals.
8. Supervise and facilitate data collection at the site using the *Field Study Agenda* as a time guide.
9. Before you leave the site, ensure that you have all your students and materials.

Field Study Agenda

- 10:15** Arrive at Site
- 10:15–10:30** Orientation
- 10:30–11:30** **First Activity Period**
Activity Group 1:
Collect and observe small aquatic animals
Activity Group 2:
Observe larger wetland animals
- 11:30–12:30** **Second Activity Period**
Activity Group 1:
Observe larger wetland animals
Activity Group 2:
Collect and observe small aquatic animals
- 12:30–12:50** Lunch
- 12:50** Clean up and load bus
- 12:55** Head back to school

**Use your
best school
manners!**



Remember that this is a field study trip and not a picnic in the park.

Teacher Field Study Checklist

- 1. Have you completed and turned in all field trip approval forms?
 - a. School field trip request form
 - b. Bus request form
 - c. Parent permission forms
 - d. Automobile liability forms
- 2. Do you have a list of emergency phone numbers for students attending the trip?
- 3. Have you contacted the field trip site and made arrangements for your visit? In Hillsborough County, some appropriate sites for this field study include Lettuce Lake Park and the Hillsborough Community College Environmental Studies Center at English Creek.
- 4. Have you reviewed the background information and trip agenda with your students?
- 5. Have you reviewed field trip rules with your students?
- 6. Have you reviewed appropriate dress with your students and informed them that they will be getting wet?
- 7. Have you made lunch arrangements and told your students about them?
- 8. Have you arranged for all of the supplies and equipment necessary for the trip?
- 9. Have you made enough copies of the *Freshwater Wetlands Data Sheet* to give to each Wetland Investigation Team?
- 10. Have you assigned students a “buddy” and divided them into two activity groups?
- 11. Do your students have nametags with their name and school in case they get lost?
- 12. Have you left the phone number of the field trip site with your office so that you can be reached in case of an emergency?
- 13. Have you arranged for adequate chaperones? (One chaperone per 10 students.)

Freshwater Wetlands Data Sheet

Activity Group # _____

Teacher _____

School _____

Date _____

Time _____

Directions: Use what you have learned to observe small and large wetland animals. Place a mark next to each animal listed on the data sheet that you observe. If you observe the same animal more than once, place additional marks next to that animal.

Invertebrates

Annelids

- _____ Leech
- _____ Worm

Arachnids

- _____ Argiope spider
- _____ Six-spotted fisher spider

Crustaceans

- _____ Crayfish
- _____ Scud
- _____ Shrimp

Insects

- _____ Butterfly
- _____ Damselfly adult
- _____ Damselfly nymph
- _____ Dobsonfly adult
- _____ Dobsonfly nymph
- _____ Dragonfly adult
- _____ Dragonfly nymph
- _____ Mayfly adult
- _____ Mayfly nymph
- _____ Mosquito adult
- _____ Mosquito larva
- _____ Mosquito pupa
- _____ Stonefly adult
- _____ Stonefly nymph
- _____ Wasp

Beetles

- _____ Predaceous diving beetle adult
- _____ Predaceous diving beetle larva
- _____ Whirligig beetle

True Bugs

- _____ Back swimmer
- _____ Belostoma water bug
- _____ Creeping water bug
- _____ Giant water bug
- _____ Water boatman
- _____ Water scorpion
- _____ Water strider

Mollusks

Bivalves

- _____ Fingernail clam
- _____ River mussel

Snails

- _____ Apple snail
- _____ Melina river snail
- _____ Melina snail
- _____ Pond snail
- _____ Rams horn

Other Invertebrates

(list below)



Freshwater Wetlands Data Sheet

page 2

Vertebrates

Amphibians

- _____ Bullfrog
- _____ Pig frog
- _____ Tadpole
- _____ Tree frog
- _____ Salamander
- _____ Siren

Birds

- _____ Blue jay
- _____ Grackle
- _____ Warbler

Birds of Prey

- _____ Bald eagle
- _____ Barred owl
- _____ Black vulture
- _____ Osprey
- _____ Red-shouldered hawk
- _____ Turkey vulture

Swimming Birds

- _____ Anhinga
- _____ Cormorant
- _____ Duck
- _____ Grebe
- _____ Gull
- _____ Tern

Wading Birds

- _____ Black-crowned night heron
- _____ Great blue heron
- _____ Great egret
- _____ Green-backed heron
- _____ Limpkin
- _____ Little blue heron
- _____ Night heron
- _____ Roseate spoonbill
- _____ Snowy egret
- _____ Tri-colored heron
- _____ White ibis
- _____ Wood stork

Fish

- _____ Bass
- _____ Bream
- _____ Catfish
- _____ Flag fish
- _____ Killifish
- _____ Mosquitofish
- _____ Mudfish
- _____ Nile perch
- _____ Pirate perch
- _____ Sailfin molly
- _____ Shiner
- _____ Sunfish
- _____ Swamp darter

Mammals

- _____ Armadillo
- _____ Otter
- _____ Squirrel

Reptiles

- _____ Alligator
- _____ Lizard

Snakes

- _____ Black racer
- _____ Brown water snake
- _____ Cottonmouth water moccasin
- _____ Florida water snake
- _____ Keeled green snake
- _____ Mud snake
- _____ Ribbon snake
- _____ Striped crayfish snake

Turtles

- _____ Musk turtle
- _____ Peninsular cooter
- _____ Red-bellied slider
- _____ Red-eared slider
- _____ Snapping turtle

Other Vertebrates (list below)

How many kinds of invertebrates did you observe?

How many kinds of vertebrates did you observe?

Lesson 6

Our Valuable Freshwater Wetlands

Primary Concept

Wetlands are important to humans because of their diversity and other benefits.

State Standards

Science:

SC.G.2.2.3, SC.H.3.2.3

Social Studies:

SS.B.2.2.2, SS.B.2.2.3, SS.D.1.2.2

Language Arts:

LA.A.2.2.5

Objective

Students will use their field study experience and further reading to develop an understanding of the benefits of wetlands.

Activity 1

What Did You Learn About Wetlands On Your Trip?

Purpose: This activity will allow your students to analyze and draw conclusions from their wetland field study.

Components/Materials

Completed *Freshwater Wetland Data Sheets* from Lesson 5; *Field Study Analysis* activity from page 37; *Wetland Data Analysis* activity from page 38; *What Did You Learn About Wetlands?* activity from page 39

Teacher Directions

1. Distribute the completed *Freshwater Wetland Data Sheets* to students. Ensure that students have the data sheet from their own activity group.
2. Distribute copies of the *Field Study Analysis*, *Wetland Data Analysis* and *What Did You Learn About Wetlands?* activities to students.
3. Have students follow the directions and complete the activities.

Activity 2

A Wetland for Your Thoughts

Purpose: This activity will provide your students with further information about why wetlands are important.

Components/Materials

A Wetland for Your Thoughts article from page 40; *The Importance of Wetlands* activity from page 41; *Wetland Attitudes* activity from page 42

Teacher Directions

1. Distribute copies of the *A Wetland for Your Thoughts* article to students.
2. Have students either read the article individually or as a class.
3. Distribute copies of *The Importance of Wetlands* and *Wetland Attitudes* activities to students.
4. Have students follow the directions and complete the activities.

Activity 3

Learning Assessment

Purpose: This activity will help students sum up what they learned during their studies and allow you to gauge your students' new knowledge.

Components/Materials

KWL sheet from Lesson 1 (if applicable); *What Do You Know About Life in Florida's Wetlands?* test from page 3; answer sheet from page 4

Teacher Directions

1. If you began a KWL chart in Lesson 1, you can now complete it. Ask your students what they learned about freshwater wetlands. Record their oral responses directly on the KWL chart.
2. Readminister the *What Do You Know About Life in Florida's Wetlands?* test from Lesson 1 to determine students' current knowledge. Allow students to reuse their previous answer sheets to record their answers. Students should record their answers in the "Posttest" column. The teacher answer key is on page 5. Results of this test may be compared with the results of the first test to gauge student comprehension of the curriculum.

Field Study Analysis

Name: _____ **Date:** _____

Directions: Think about what you observed and learned on your field study to fill in the blanks below.

Field study site:

Five things I observed:

Three new things I learned:

What I liked best:

What I would like to learn more about:

Wetland Data Analysis

Name: _____ Date: _____

Directions: Using the *Freshwater Wetlands Data Sheet* from your field study, complete the activity below.

Invertebrates

1. How many kinds of wetland invertebrates did you observe?

2. List some of them:

3. Draw two that you observed:

Vertebrates

1. How many kinds of wetland vertebrates did you observe?

2. List some of them:

3. Draw two that you observed:

A Wetland for Your Thoughts

*From the Southwest Florida Water Management District's
SPLASH! Water Resources Education program.*

As settlers journeyed through the young United States, they built roads, cities and various infrastructure.

Swamps, marshes and other wetlands were often seen as worthless, standing in the way of progress. As America grew, wetlands were destroyed. Between the 1780s and mid-1980s, more than 50 percent of wetlands were lost. Of the 215 million acres of wetlands, only about 100 million acres remain.

In the 1800s, wetlands covered more than half of Florida. The state has lost nearly half of its wetlands since pioneer times. Wetlands today cover just 30 percent of Florida.

Today, attitudes regarding wetlands have come full circle. What were seen as wastelands as recently as 30 years ago are now regarded as an invaluable resource to our quality of life.

The Southwest Florida Water Management District (SWFWMD) promotes the preservation of wetlands. The SWFWMD regulates human activities and development that take place in wetlands covering all or part of 16 west-central Florida counties. The SWFWMD also buys sensitive tracts of wetlands, such as the Green Swamp, through state programs such as Save Our Rivers and Florida Forever. The aim of these acquisitions is to protect the land for the water's sake.

Wetlands provide protection from flood and storm damage. Wetlands temporarily store floodwaters, protecting property owners downstream from more severe flooding. They also slow floodwaters, lowering wave heights and reducing soil erosion. Researchers at the University of Florida discovered that when wetlands make up as little as 10 percent of the landscape, flooding

decreases by 60 percent. When wetlands cover 20 percent of an area, flooding decreases by 90 percent.

Wetlands contribute to water supplies. The Green Swamp serves as the headwaters of four major rivers: the Hillsborough, Peace, Withlacoochee and Ocklawaha. The area is extremely important for groundwater recharge because the aquifers are near the land surface.

Wetlands may affect climate. It is speculated that by creating updrafts, wetlands in the Everglades trigger the summer rains vital to the water cycle of south Florida. Wetlands may also help moderate temperature extremes by slowly releasing heat on the coldest winter days and by cooling the air during the summer.

Wetlands provide nursery areas, nesting habitat, wintering habitat and feeding grounds for fish and wildlife. Spectacular wading birds, including herons, egrets, ibises, spoonbills and storks, feed and nest in wetlands. In addition, hundreds of thousands of the Atlantic Coast's wintering waterfowl depend on Florida's wetlands.

Large mammals, such as white-tailed deer, bobcats, grey foxes, black bears and panthers, use wetlands for denning sites, movement corridors, escape cover and food. The largest reptiles in the United States, the American alligator and the endangered American crocodile, live in Florida's wetlands.

Information Source:
U.S. Fish and Wildlife Service

The Importance of Wetlands

Name: _____ Date: _____

Directions: During your field study and from your reading, you learned about the importance of wetlands. Complete the chart below to describe what you learned.

<p>Importance of Wetlands to Humans</p> 	<p>Learned from Field Study</p>	<p>Learned from Reading</p>
<p>Importance of Wetlands to Wildlife</p> 	<p>Learned from Field Study</p>	<p>Learned from Reading</p>

Vocabulary List

Abdomen

Third segment on an insect's body that contains digestive and reproductive organs

Adaptation

Structure, function or behavior of an organism that enables it to be better suited to its environment

Air storage area

Structure found on insects that holds trapped air for use while the insect is submerged

Amphibian

Vertebrate that lives part of its life on land and part of its life in water; the young usually go through a metamorphosis before reaching adulthood

Anaerobic

Having a low level of oxygen, like wetland soils

Aquatic system

Natural systems that are continuously covered with water, including lakes, rivers and oceans

Arachnid

Invertebrate that is related to an insect, but differs because it usually has two body segments and eight legs

Bird of prey

Also called a raptor; a carnivorous bird that has long, curved talons to catch and kill prey, and a sharply hooked beak for tearing meat



Calcium carbonate

Compound secreted by mollusks to build their shells

Carnivore

Animal that eats other animals

Cattail marsh

Marsh in which cattails are the major plant species

Cold-blooded

Animal that has no internal heat and must rely on the sun for warmth

Complete metamorphosis

Four-stage growth process of change in body form in insects

Crustacean

Invertebrate characterized by a hard exoskeleton, jointed legs and segmented bodies

Cypress dome

Stillwater swamp community of cypress trees that forms in a shallow depression in the land; the tallest cypress trees grow near the center of the depression with tree height decreasing toward the edges, creating a dome-shaped appearance



Cypress knee

Structure that grows up from the root of cypress trees; a knee has a tiny opening that draws in oxygen to the tree roots under the swamp water

Decomposer

Organism that converts dead plants and animals to nutrients

Exoskeleton

Skeleton that is on the outside of the body used by insects, crustaceans, arachnids and mollusks

Fish

Vertebrate that has gills that allow it to breathe underwater

Flag marsh

Marsh in which plants with flaglike leaves are the major species

Gill

Special organ that allows animals to breathe underwater

Hydric hammock

Driest of the swamps, usually flooded for only short periods; can be categorized as either riverine or stillwater

Incomplete metamorphosis

Growth process or change in body form in insects that lacks a pupa and larva stage; eggs hatch into nymphs

Insect

Invertebrates with six legs and three main body parts, called segments

Invertebrate

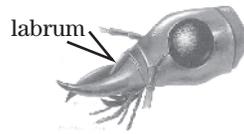
Animal without a backbone

Keel

Ridge on the scales of water snakes to help with swimming

Labrum

Scooplike lip on some insects

**Larva**

First stage of metamorphosis in some animals; the larva usually does not look like the adult animal

Marsh

Freshwater wetland that features grasses, sedges, rushes and other soft-stemmed plants as the major type of vegetation

Metamorphosis

Growth process or change in body form in some animals including insects and some amphibians

Mollusk

Invertebrate that secretes calcium carbonate to use in creating its own shell

Nonvenomous

Animal that is not poisonous

Nymph

Immature insect that looks like a smaller version of the adult

Omnivore

Animal that eats both plants and animals

pH

Measurement of acidity; the lower the pH level, the higher the acidity

Piercing beak

Mouthpart found on some insects that is used to squirt saliva into their prey; the saliva digests the soft inner tissue of the prey and the fluid is then sucked out of the prey's body

Predator

Animal that hunts and eats other animals

Proboscis

Specialized structure found on mosquitoes and other insects that allows them to pierce an animal's skin and suck out blood

Pupa

Third stage in insect metamorphosis in which the larva encloses itself in a cell to undergo further development

Raptor

Another term for bird of prey

Reptile

Vertebrate that has scaly skin that keeps its body from drying out; does not go through metamorphosis

Riverine swamp

Swamp that has water flowing within it

Sawgrass marsh

Marsh in which sawgrass is the major plant

Spiracle

Breathing pore used by insects that allows them to breathe underwater

Stillwater swamp

A swamp that does not have water flowing through it

Submersed marsh

Marsh that has water that is generally 3 to 4 feet deep

Swamp

Freshwater wetland that features trees as the major type of vegetation

Swimming bird

Bird with webbed feet that helps it paddle quickly through the water

Tannin

Dark-colored chemical that is released from tree leaves as they soak in the warm water

Thorax

Middle segment of an insect's body that contains the legs and wings

Trachea

Breathing tube used by insects to help them breathe underwater

True bug

Type of insect that has sucking mouthparts and two pair of wings

**Upland**

Dry land that is higher than surrounding lands

Venom

Modified form of saliva that can kill prey

Venomous

Animals that use venom to help kill their prey

Vertebrate

Animal with a backbone

Visceral mass

Region of a mollusk where the organs are located

Wading bird

Carnivorous bird that has long legs and large feet to walk through shallow water hunting for food

Water lily marsh

Marsh in which water lilies are the major plant species

Wet prairie

Marsh that is infrequently flooded

Wetland

Land that is soaked or flooded by water for part of the year

Wetland plant

Plant that can survive in soaked or flooded land

Wetland soil

Soil that is changed by the presence of water; usually dark in color, sticky and low in oxygen and pH



Southwest Florida
Water Management District



This information will be made available in accessible formats upon request. Please contact the Communications Department at (352) 796-7211 or 1-800-423-1476 (FL only), ext. 4767; TDD only at 1-800-231-6103 (FL only).