

## Chapter 14

# The Cypress Swamp

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### Introduction

Swamps are associated with ponds and lakes; in fact, they are usually located in low-lying areas adjacent to these bodies of water. Swamps are wetlands with many trees and are teeming with plant and animal life characteristic of the area. A swamp is often shallow, with water temperatures that are uniform from top to bottom. There is little wave action, and the swamp bottom is usually covered with mud. Cypress swamps, named after the dominant plant form, are common in the central and lower Mississippi basin and coastal plains of the southeastern U.S. The water is often brown because of the presence of **tannic acid**. Many cypress swamps are dry during parts of the year.

Cypress trees are gymnosperms, which are plants characterized by needle like leaves, conspicuous cones, and seeds not enclosed in a fruit. Most gymnosperms are evergreen; the cypress, however, is deciduous (sheds its leaves during a portion of the year). Cypress trees can live for over 600 years, but, the ones in the swamp at the Tallahassee Museum of History and Natural Science are not that old. The cypress has its base and roots submerged below the water level. The swollen base of the trunk and extensive, shallow root system are thought to be adaptations to the watery conditions of the swamp. Parts of the root system are very unusual. Instead of staying underground like most roots, these parts grow out of the ground forming upside-down U-shapes. Because these above-water roots look like a human leg bent at the knee, they are called “cypress knees.” No one is sure exactly what cypress knees do. Some hypotheses are that they balance the tree, absorb gases from the air, or even anchor large trees. We do know that cypress knees are more common on larger, older trees than on younger ones.

In Florida’s cypress swamps numerous plants grow on the trees. These include orchids, and Spanish moss (a member of the pineapple family). Other plants found in a cypress swamp include black gum, sparkleberry, bay, saw palmetto, maple, willow, buttonbush, and several varieties of pine and oak. The plants in a swamp provide food and shelter for a variety of animals, such as squirrels, birds, insects, frogs, snakes, turtles, and raccoons. An animal that isn’t at home in the swamp is man. The mud, darkness, and fear of snakes and other wild animals keep most people out of the swamps. As a result, many animals still live in swamps after their relatives in nearby forests have been killed or driven from their usual habitats by urbanization. Florida’s swamps are thus a place of safety for bears, deer, Florida panthers, bobcats, otters, snakes, alligators, and many other widely hunted animals. Birds of many types

are found nesting in swamps. Hawks, egrets, eagles, owls, red winged blackbirds, coots, sparrows, cardinals, blue birds, woodpeckers, and even hummingbirds live in cypress swamps.

The organisms in an ecosystem will often inhabit distinct regions. This phenomenon is referred to as **stratification**. Stratification in a swamp is most easily illustrated if the area is divided into vertical layers. The taller trees form the canopy, or overstory, and the smaller shrubs and bushes form the understory. Other zones include the ground, water, and underlying mud. A characteristic group of organisms is associated with each layer. Fish and algae, for example, are found in the water, worms and snails on the ground, and birds in the canopy.

Swamps are important both ecologically and economically to the state of Florida. Florida's Everglades form the largest area of marsh and swamp in the United States. These huge wetlands cover more than two and a half million acres over much of the southern tip of Florida. The Everglades serve as a home for both terrestrial and aquatic creatures and as a natural filter or aquifer for Florida's water supply.

The swamp at the Tallahassee Museum of Natural History and Science, although not as extensive as the Everglades, performs a similar function and is thus an important ecosystem in the Tallahassee area.

### Materials

sling psychrometer (2)	water thermometer
squeeze bottle of water	secchi disk
beaker	pH paper
test tubes	sampling jars
transect line	pH standards
quadrants or a Hula-Hoop	plankton net
soil corers	bottom dredge
tray	dip nets
paper towels	seine net
pH test solution	2 pairs of boots (hip waders)

### Notes for the Instructor

#### Trip Procedures

1. We assemble trip packets to aid as we take groups to the Museum. Trip packets contain:
  - A. Role Sheet
  - B. Map to Junior Museum, directions, trip schedules, and emergency contact phone numbers.
  - C. List of TA's assigned to each trip
  - D. Trip procedures
  - E. Sheet for each student to sign- before riding on vans to the museum.

Each clipboard has an attached:

- A. Trail map indicating starting station locations and direction of travel
- B. Equipment list for each station
- C. Pencil

2. The first group to go to the Museum each morning takes out all the equipment. The last group each day brings back all the equipment.
3. As the students load the vans, teaching assistants take the roll.
4. Students are divided into groups. It is great to have 8 or fewer in a group! More learning takes place! TAs are assigned stations and groups of students.
5. Upon arrival at the museum, one TA goes to the front desk to tell the receptionist how many people are in attendance and how many teaching assistants are present.
6. Once inside the museum, each TA meets with his/her assigned group, picks up any equipment necessary for his/her starting station, and walks to the appropriate location.
7. Each station should be planned to take approximately 25 minutes. Plant and animal walks may take slightly longer; sampling stations may take slightly less. TAs plan their teaching according to the schedule suggested. If TAs take too much or too little time, it may cause difficulties for the other groups as groups move from station to station.
8. When a group is finished at a station, the equipment is returned to the appropriate starting location so the next group will be able to proceed smoothly with the lab exercise.
9. After completing the last station, TAs gather the equipment used and clean the equipment thoroughly. The last group of the day brings the equipment to the vans to be secured over night. **Do not leave the equipment at the museum at night!**
10. A group of students is at the Museum for 3 hours. The time allotted for the lab exercises is:
  - Plant walk: 20 minutes
  - Terrestrial sampling: 15 minutes
  - Animal walk: 25 minutes
  - Aquatic sampling: 20 minutes

### Teaching Objectives

The main objective of this lab is to give students an opportunity to learn about an ecosystem: biotic factors, abiotic factors, and the interaction between the two. The lab is divided into four sections: 1) a plant walk, 2) a terrestrial sampling site, 3) an animal walk, and 4) an aquatic sampling site. The plant and animal walks are designed to acquaint students with some of the dominant types of organisms in a cypress swamp ecosystem. The sampling sites are designed to expose students to the various ways in which biologists study ecosystems.

### Guidelines for TAs

As you proceed from station to station, try to establish a relationship between the various components of the cypress swamp ecosystem- how everything fits together. You may approach this in whatever manner you like, as long as you get the major objectives across. The walks are straightforward; there are a couple of options for the sampling stations. The students are expected to participate in sampling activities- how you choose to do this is up to you. You may wish to demonstrate the activity, and select a couple of students to try it, and proceed through all the activities making sure that most students participate at least once; you may wish to divide the activities into logical units, and divide the students among the activities, and either rotate these smaller groups among the activities or have each group report their findings after several sampling efforts. You must, however, try to have all students participate at some point, and you need to plan this so that you use 20-25 minutes efficiently.

**Station A - Plant Walk**

Equipment: none

**Objectives:**

1. Locate representatives from each of these groups:
  - a - Fungi (occasionally found on trunks of trees, occasionally on fallen trees or in moist, shaded areas.)
  - b - Algae (occasionally found in still water or around the bases of cypress trees.)
  - c - Lichens (abundant; crustose, foliose and fruticose forms)
  - d - Mosses (along pathway and under trees; gametophyte and sporophyte stages)
  - e - Ferns (occasionally found in “crooks” of branches)
  - f - Gymnosperms (abundant; pines, cypresses, and junipers)
  - g - Angiosperms (abundant; oaks, black gums, etc.)

Discuss the following:

- a - Identification criteria, key characteristics
- b - Habitat requirements
- c - Reproductive strategies
- d - Role in a food web
- e - Role in nutrient cycling
- f - Other interesting facts

Suggestions:

- a - Compare the various types of pines
- b - Compare the various types of oaks
- c - Discuss photosynthesis- where it takes place, and where the nutrients and products are transported

2. Discuss the following ecological processes:
  - a - Fire ecology - the role of fire in maintaining a certain community
  - b - Succession - how plant communities develop
  - c - Energy flow - the role of plants and their position in a food web
  - d - Nutrient cycling - the role of plants in organic molecule synthesis and the return of nutrients after death

Suggestions:

Explain the general concepts first, and then relate them to the cypress swamp ecosystem using the organisms to illustrate.

3. Focus on the cypress tree as the dominant plant form.  
Discuss various aspects of the cypress tree:
  - a - Morphology; swollen base and knees
  - b - Deciduous gymnosperm
  - c - Indication of high water level
  - d - Fate of leaf litter

### Station B - Terrestrial Sampling

Equipment: sling psychrometer (2), water, beaker, test tubes (5), transect line, 0.10m<sup>2</sup> quadrats (5), soil corers (2), tray, paper towels, pH test solution

#### Objectives:

1. Measure the following parameters:

- a - Air temperature
- b - Relative humidity

Demonstrate how to measure rainfall

Discuss how these factors affect organisms in a swamp ecosystem.

Suggestions:

- a - Discuss other physical factors that could be measured and the importance of these factors to the ecosystem - air quality, amount of light, evaporation, wind, etc.

2. Explain how transects are used in terrestrial sampling. Set a transect and identify the plants along the transect at a specific scale. Discuss your findings. Are they representative of the ecosystem you are studying?

3. Explain how quadrats are used in terrestrial sampling. Use the quadrats provided to sample terrestrial organisms.

4. Sample soil along a transect. Compare the various soil samples with regard to the following properties:

- a - Inorganic content
- b - Organic content
- c - Water content
- d - Gas content

Discuss how these and other soil properties affect the organisms in a swamp ecosystem.

5. Discuss vertical and horizontal zonation, using the transect as a reference for the latter. Discuss the characteristics of the plants in different zones.

6. Discuss ways in which you might sample other organisms - insects, amphibians, reptiles, birds, and mammals.

### Station C - Animal Walk

Equipment: none

#### Objectives:

1. Locate the different animals associated with a cypress swamp ecosystem:

- a - Birds-of-prey
- b - Waterfowl
- c - White-tailed deer
- d - Otters
- e - Red wolf
- f - Bobcat
- g - Florida panther
- h - Alligator

- i - Black bear
- j - Grey fox
- k - Striped skunk

Discuss the following:

- a - Habitat requirements
- b- Ranges
- c - Location in food web -prey
- d - Location in food web -predators
- e - Reproductive strategies
- f - Other unique aspects of individual life histories

Suggestions:

- a - Discuss how various physical parameters affect these organisms
- b - Discuss the relationship of these animals to plants in the ecosystem

### **Station D - Aquatic Sampling**

Equipment: water thermometers (2), Secchi disk, pH paper, sampling jars (3), paper towels, pH standards, plankton net, bottom dredge, dip nets (2), seine net, boots

#### **Objectives:**

1. Measure the following parameters:
  - a - Water temperature
  - b - Depth
  - c - Turbidity
  - d - pH

Discuss some generalizations that could be made about these parameters in a cypress swamp ecosystem. How might these factors affect the aquatic plants and animals? Discuss other factors that you might measure and their importance in this ecosystem - color, light, water quality, dissolved oxygen, etc.

2. Explain what plankton are, and their role in the ecosystem. Demonstrate the use of a plankton net and collect several plankton samples.
3. Explain what detritus is. Demonstrate the use of the bottom dredge and collect several dredge samples. Discuss the significance of your findings.
4. Discuss the type of aquatic organisms you might expect to find when sampling with nets.
  - a - Use a seine net
  - b - Use dip nets
5. Discuss other organisms that you might sample and the devices you might use - corer, etc.

### **Student Outline**

#### **Objectives:**

The student will:

1. Visit a local cypress swamp and will participate in the following activities:
  - a. Plant walk to identify examples from major plant groups
  - b. Terrestrial sampling, including use of transect, quadrats, and soil sampling equipment

- c. Animal walk and identification of native cypress-swamp animals, including a discussion of their roles in a cypress-swamp food web
  - d. Aquatic sampling, including use of a bottom dredge, Secchi disk, plankton net, dip net, sling psychrometer, and water thermometer
2. Discuss the importance of each of the ecosystems studied.

### **Lab Exercise (Cypress Swamp Field Trip)**

During the lab period, we will go by bus on a field trip to the Tallahassee Museum of Natural History. This museum is located on Lake Bradford and combines historical buildings, a pioneer farm, a bird sanctuary, a cypress swamp, and a natural-habitat zoo in a beautiful woodland setting. We will study the cypress swamp that borders the museum on the lake.

One simple approach to ecosystem analysis involves observing the various plants and animals you encounter and measuring the physical factors that affect them. The class will be divided into groups for the following activities. All group members should participate in each activity.

The groups will rotate, enabling each student to be involved in every activity. The following outline should prepare you for this lab.

**Activity A: Plant Walk:** Identification of representatives of major plant groups; discussion of ecological processes in plant communities; observation and discussion of cypress communities.

**Activity B: Terrestrial Sampling:** Use of transect and quadrants to sample terrestrial organisms; use of soil corer to sample soil and soil organisms; measurement of physical factors.

**Activity C: Animal Walk:** Identification of animals associated with the swamp ecosystem; discussion of life histories and habits; discussion of roles in food web.

**Activity D: Aquatic Sampling:** Use of plankton net, bottom dredge, dip nets, and seine net to sample aquatic organisms; measurement of physical factors.

### **Literature Cited**

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### **Acknowledgements**

Special thanks to Rodney McPhail and Laura Cummings for adaptation of figures.

## Appendix A

### A GUIDE TO THE TALLAHASSEE MUSEUM OF HISTORY AND NATURAL SCIENCE NATURAL HABITAT ZOO AND NATURE TRAIL

Text\* and some Photographs by  
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\*Portions of text are based on a previous version of a guide provided by the Tallahassee Museum Of History And Natural Science (author unknown).

This guide, which is designed as an instructional tool, will help in gaining a greater understanding of native Florida animals found at the Museum. You can learn more about their unique characteristics, habits and habitat requirements, and potential threats to their survival.

This guide begins at the birds of prey habitat. If you begin walking the habitat trail backwards, starting at the reptile exhibit, simply flip through the guide backwards. For information on the guest animal, please see the sign at the guest animal habitat for current information.

As you are viewing the animals, please bear in mind that all of the zoo animals, either have permanent injuries, are part of a captive breeding program to help recover the species, or were orphaned when young. Orphaned animals raised in captivity are usually dependent on their human keepers and are unsuitable for release into the wild.

#### BALD EAGLE

*Haliaeetus leucocephalus*



**General Characteristics:** Adult Bald Eagles are dark brown with a white head and tail; yellow eyes, beak and feet; and a wingspan of 6 to 8 feet. Juveniles are dark in color with white mottling in the wings and tail.

**Habitat:** Bald Eagles generally live and nest in tall pines or cypress trees near bodies water such as lakes, rivers, marshes, and coastlines.

**Range:** Bald Eagles could traditionally be found throughout North America. Current populations are limited mainly to Alaska, western Canada, Florida, and the northwestern states.

**Diet/Feeding:** Bald Eagles are active during the day and primarily feed on fish, but also eat small mammals such as rabbits, smaller birds, and carrion. Eagles have amazing eyesight. A soaring eagle might spot a rabbit moving across a field from nearly two miles away. Part of its eye acts as a type of telephoto lens, zooming in on moving prey. The eagle can swoop down on its prey at speeds of up to 100 mph, capturing the prey with its powerful talons.

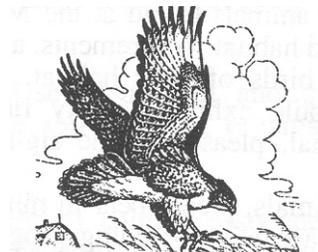
**Mating/Breeding:** Bald Eagles are thought to mate for life and build nests of sticks 4 to 5 feet tall and 6 feet wide (sometimes weighing over 1 ton). Florida has 300 to 400 active nests every year, making up most of the southern population. Eggs are laid between late November and early February (1-3 eggs per pair) and hatching takes about 35 days. The young leave the nest 10-12 weeks after hatching.

The Bald Eagle is the national symbol of the United States and was declared an endangered species in 1967. The primary cause for the decline in Bald Eagle populations is a process known as biomagnification. Pesticides such as DDT were sprayed on farm crops to control pests. These pesticides

wash into streams, rivers and lakes and are absorbed by microscopic animals and plants. These are then eaten by small fish such as minnows. Larger fish eat the minnows and still larger fish eat these fish. As the pesticides move up the food chain, they are stored in the fatty tissues of the larger fishes in higher and higher concentrations. Bald Eagles would then catch some of these poisoned fish to eat. The pesticides usually would not kill the eagles, but the shells of their eggs would become so thin that the eggs would break during incubation. DDT was banned in the US in 1972. Since that time, and with the aid of breeding programs, eagle populations have been rising steadily and the Bald Eagle was upgraded from endangered to threatened in 1995. However, the US still exports DDT and other pesticides to other countries around the world and the problem of biomagnification is a major concern for wildlife around the globe.

**Note:** It is unlawful (a federal offense) to possess eagle feathers because eagles have historically been killed for their feathers. This is true for all other birds of prey as well.

Only American Indians may possess these feathers for use in religious and cultural ceremonies.



### RED-TAILED HAWK

*Buteo jamaicensis*

**General Characteristics:** Adult Red-tailed Hawks are generally dark brown in color with a distinctly lighter underbelly and a dark band across the midsection. Adults are further characterized by reddish tail feathers which may have black tips forming a bar at the end of the tail. Juveniles are similar to adults except that the tail feathers are dark until maturity.

**Habitat:** Red-tailed Hawks generally live and nest near the edges of woodlands, usually bordering open fields, grasslands, swamps, and marsh-scrub areas.

**Range:** Red-tailed Hawks are found throughout the US and Canada, extending South into Mexico and Central America.

**Diet/Feeding:** Red-tailed Hawks are active during the day and feed on a variety of prey. The majority consists of small rodents such as squirrels and mice. The remainder of their diet is mainly reptiles and small birds. Red-tailed Hawks rely on keen eyesight and high speed flight to catch prey.

**Mating/Breeding:** Red-tailed Hawks are thought to remain monogamous for many years, usually only finding a new mate when the previous one dies. Nests of sticks up to 3 feet wide are built in deciduous trees and are used year after year. Eggs are laid in April and May (2-4 eggs per pair) and hatching takes about 30 days. The young leave the nest as soon as they can fly, usually about 45 days.



### GREAT HORNED OWL

*Bubo virginianus*

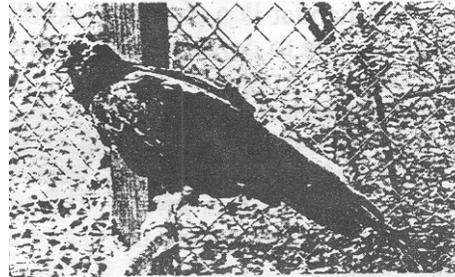
**General Characteristics:** Great Horned Owls are the largest of the North American Owls. Adults can vary in color from dark brown to gray, with lighter mottling and a white patch at the throat. The "horns" are large tufts of feathers, prominently located on the top of the head just above the ears. Juveniles are similar to adults.

**Habitat:** Great Horned Owls generally live and nest in a variety of woodland areas, bordering open fields that are favorable to hunting.

**Range:** Great Horned Owls are found throughout North and South America, wherever suitable habitats are found.

**Diet/Feeding:** Great Horned Owls are active mainly at night and are voracious predators, feeding primarily on small mammals such as rabbits, squirrels, and mice. Owls have excellent eyesight, their night vision in particular, is far superior to human night vision. Owls cannot move their eyes, so they must move their entire head to view a moving object. They can quickly turn their head nearly 180 degrees in either direction and some early observers thought that they could turn their heads completely around. However, owls often rely more on their hearing than their eyesight. In fact, recent studies have shown that an owl could detect the sound of your heartbeat from up to 100 feet under the right conditions. Another nighttime advantage for owls is silent flight. Their feathers are fringed with a soft edge to cut through the air with virtually no sound.

**Mating/Breeding:** Great Horned Owls usually do not build their own nests, but take over the abandoned nests of other large birds, or may nest in cavities in trees and cliffs. Mating takes place in winter and 2 to 3 eggs are laid between January and March. Hatching takes about 32 days. The young leave the nest 6 to 9 weeks after hatching.



## TURKEY VULTURE

*Cathartes aura*

**General Characteristics:** The Turkey Vulture is a large bird, roughly the size of a small eagle, with a wingspan of up to 6 feet. Turkey Vultures are brownish black in color. The head and upper neck are featherless and is red in color in adults, gray or black in juveniles.

**Habitat:** Turkey Vultures live in all types or habitats; open plains, forests, deserts, marshlands, and swamps, wherever food is available.

**Range:** Turkey Vultures are found throughout southern Canada, most of the US, and southward into Mexico. Populations can also be found in central and southern South America.

**Diet/Feeding:** Turkey Vultures are active during the day and feed almost exclusively on carrion (the remains of dead animals). Prey is usually located by sight while in flight, but Turkey Vultures also have a well-developed sense of smell. Carrion feeders fill an extremely important ecological niche by cleaning up decaying animals which can be a source of disease.

**Mating/Breeding:** Turkey Vultures do not build nests. Eggs (usually 2) are laid on the ground, under cover, or in cavities in trees or rocks. Vultures are not particularly social animals and pairs usually only remain together for one mating season. Mating occurs in spring and eggs hatch in about 5 weeks. Young leave the nest about 3 months after hatching.



## SCREECH OWL

*Otus asio*

**General Characteristics:** The Screech Owl is a small owl, usually about 8 inches tall. These owls have two distinct color phases, a red phase, when the owl is mostly reddish, mottled with white, and a gray phase, when the owl is mostly gray, mottled with white. Screech Owls also have prominent ear tufts and are often mistaken for baby Great Horned Owls.

**Habitat:** Screech Owls generally live and nest in woodland areas bordered by open fields, much like other owls.

**Range:** Screech Owls are found throughout the US, southern Canada, and northern Mexico.

**Diet/Feeding:** Screech Owls are active at night and feed primarily on small rodents such as mice, but also eat small reptiles and large numbers of insects such as grasshoppers and beetles.

**Mating/Breeding:** Screech Owls nest in cavities in hollow trees, rocks, etc., and will also use man-made nesting boxes. Mating takes place in late winter and 3 to 8 eggs are laid in early spring. Hatching takes 25 to 35 days. The young leave the nest 3 to 5 weeks after hatching.



## WATERFOWL HABITAT

The waterfowl habitat is a natural sinkhole pond. The habitat is not enclosed, therefore any animals that visit are free to come and go as they please. For this reason, animals are not always present for you to see. Frequent visitors include Canadian Geese, Mallard Ducks, Wood Ducks and a variety of other waterfowl. You may also see snakes, turtles and a wide variety of plant life.

You will surely see the man-made Wood Duck nesting boxes near the west bank of the pond. These boxes are similar to the hollow trees that these ducks normally nest in, but the small openings help to keep predators away. The wood duck was once an endangered species due to over-hunting. Strict regulations and the use of artificial nest boxes such as these have helped in the recovery of the species.



## WHITE-TAILED DEER

*Odocoileus virginianus*

**General Characteristics:** Adult White-tailed Deer coloration varies from reddish-brown in summer to grayish-brown in winter, with white fur around the eyes, nose, neck, and most noticeably, on the underside of the tail. White-tailed Deer have excellent eyesight and hearing, but are thought to rely mostly on their highly developed sense of smell to detect danger. If a threat is detected the deer wave their upturned tails quickly from side to side as a signal to flee the area. A similar tail signal may also be used to reform the group after the danger has passed. Male White-tailed Deer also have antlers which are shed each year in late winter and re-grow in the spring. Antlers are a unique feature to the deer family and differ from horns in that horns are permanent structures.

**Habitat:** White-tailed Deer live in a wide variety of habitats; pine and deciduous forests, marshlands, swamps, and open plains, wherever food and adequate cover is available.

**Range:** White-tailed Deer are found throughout southern Canada, nearly all of the mainland US (except the harshest areas of the desert southwest), and southward into Mexico and Central America.

**Diet/Feeding:** White-tailed Deer are crepuscular (active mostly at night with peak activity near dawn and dusk) and are herbivores, feeding on a wide variety of vegetation such as grasses, leaves, twigs, herbs, and acorns.

**Mating/Breeding:** Mating (also called rutting) begins in late summer and early fall with males using their antlers to fight for access to receptive females. Females give birth to the young (usually 2), called

fawns, in the spring after a gestation period of 6.5 to 7 months. Deer fawns are spotted to provide camouflage and have no scent when they are born, providing them protection from predators. The fawns are weaned and foraging on their own after 6 to 8 weeks, but may remain with their mother for up to 2 years.

**Note:** White-tailed Deer were hunted to the brink of extinction by the mid 1930's. Since that time, with the aid of strict hunting regulations and population management techniques, deer populations have risen steadily. In fact, these deer have become so common that hunting is actually considered biologically necessary in some areas in order to keep deer populations from depleting their food supplies and starving.

You may also notice a "white" female deer in the deer habitat. This particular White-tail has an unusual color pattern known as "piebald" coloration. The predominantly white color with patches of the normal coloration is the result of a fairly rare genetic mutation. This mutation is rarely observed in the wild, most likely because this type of color pattern would make these deer particularly prone to perdition.

## EASTERN GRAY SQUIRREL

*Sciurus carolinensis*



**General Characteristics:** Adult Eastern Gray Squirrels are generally gray to reddish gray in color with a white underbelly and neck. They have an average body length of 8 to 12 inches (not including the tail) and can weigh up to 2 pounds.

**Habitat:** Eastern Gray Squirrels prefer mature woodland areas, particularly those with trees that produce large quantities of nuts and seeds such as oaks, walnuts, and pecans. They have also adapted to farmlands and urban areas where food is available.

**Range:** Eastern Gray Squirrels are found throughout the eastern US and southeastern Canada extending westward beyond the Mississippi River into Texas.

**Diet/Feeding:** Eastern Gray Squirrels are active during the day and feed primarily on nuts, berries, flowers, pine cones, and other vegetation, but also supplement their diet with insects, bird eggs, and occasionally small birds. Squirrels often bury stores of food for winter, which they later locate by using their exceptional sense of smell.

**Mating/Breeding:** Eastern Gray Squirrels usually breed twice each year, once in the spring and again in the fall. Females mate with several males and after mating build nests from twigs and leaves (resembling bird nests) high in nearby trees. These nests may be reused many times. Following a gestation period of 40 to 44 days, females give birth to 2 to 5 blind, hairless young. The young squirrels develop rapidly, and usually leave the nest after 8 to 10 weeks.

**Note:** You may also have noticed white squirrels on the Museum grounds. These squirrels are a genetic deviation (mutation) of the gray squirrel. The population at the Museum is descended from a single female white squirrel that came from the area around Sopchoppy Florida in 1965. They are not albinos, pigment does remain along the back and in the eyes (albinos have pink eyes). White squirrels are rarely seen in the wild because they are easily spotted by predators such as hawks.

## RIVER OTTER

*Lutra canadensis*



**General Characteristics:** River Otters are well adapted for life in an aquatic environment. They have thick, waterproof fur. Their bodies are long and streamlined with a somewhat flattened tail. They have short legs, webbed feet with sharp claws, and their nose and ears have valve-like flaps of skin that can be closed when diving under water. They are generally dark brown in color with a slightly lighter underside. Swimming is accomplished through a series of undulating motions of the body, leaving the limbs free to help in capturing prey. Otters are often observed in a wide variety of "play" activities, but these activities serve a distinct purpose. This playful behavior serves to sharpen reflexes and maneuvering ability, to build muscles, and tune critical hunting skills.

**Habitat:** River Otters can be found in most types of wetland habitats such as along lakes, rivers, marshes, and swamps.

**Range:** River Otters are found throughout North America in areas with suitable habitats. They are most common in Alaska, Canada, and (to a lesser extent) Florida.

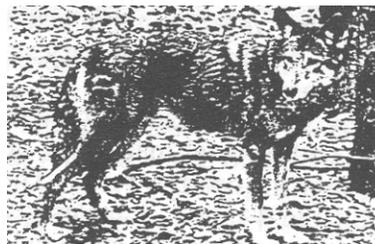
**Diet/Feeding:** River Otters are active both day and night (more often at night) and feed on a variety of mostly aquatic animals such as fish, crayfish, and frogs. They also occasionally take birds and small land mammals. Otters hunt mainly by sight and through the use of sensitive vibrissae (whiskers), which are used to detect movement of prey items in the water.

**Mating/Breeding:** River Otters are generally solitary, except during mating. Males and females mate in early spring, and tend to remain together until the resulting offspring are off on their own. About 10 months after mating the females bear 1 to 5 young in den at the waters edge. The male is usually driven away for short time following the birth, but is later allowed back to help in the care and feeding of the young. The young otters are fairly self-sufficient after 3 to 4 months and usually leave the parents after about 1 year.

**Note:** The River Otter is considered a "Species of Special Concern." Populations are declining rapidly throughout many parts of their range. Humans are the major threat to the River Otter. Biomagnification of chemical toxins such as mercury, water pollution, marsh drainage, waterfront development, and other human activities have all contributed to widespread destruction of their habitats.

## RED WOLF

*Canis rufus*



**General Characteristics:** The Red Wolf is the smallest of the wolf species and is one of the rarest mammals in North America. It is in fact, considered to be extinct in the wild. The Red Wolf is generally dark gray in color with broad areas of tawny-red fur. The Red Wolf also has a more slender build than the more commonly recognized Gray Wolf.

**Habitat:** The Red Wolf's traditional habitats included most habitats common to the southeast, including pine and deciduous forests, marshlands, swamps, and coastal plains.

**Range:** Red Wolves were once found throughout the southeastern US.

**Diet/Feeding:** Red wolves are mostly nocturnal with peak activity near dawn and dusk. They generally hunt alone or in small family groups and prey mostly on small animals such as rabbits, rats, mice, squirrels, small hogs, birds, fish, crabs, crayfish and insects.

**Mating/Breeding:** Red Wolves are thought to mate for life, although the lack of natural populations make this difficult to study. The wolves establish dens, which can be quite large, and are used year after

year. Mating occurs in late winter and pups (usually 3 to 4) are born in the spring. Both parents participate in rearing of young which stay with the parents for 6 months to 1 year (sometimes longer).

**Note:** Red Wolves once numbered in the thousands, roaming the entire southeast and part of the south central United States. Currently there are only about 250, approximately 200 of these are in captive breeding programs in zoos across the US. The remaining 50 wolves are part of The Red Wolf Recovery Project, which has established small, experimental populations in a few select locations in the US. As part of the Recovery Project, a breeding pair from this Museum was trained on St. Vincent's Island Wildlife Refuge for release into the wild. Over time, they had two litters of pups and they are currently living wild in the Great Smoky Mountains National Park in Tennessee.

What happened to the red wolf? Out of fear and misunderstanding, red wolves have been killed since the first Europeans set foot on this continent. Early in the 1900's the Federal Predator Control Program placed bounties on the pelts of these and other wolves and the last Red Wolf in Florida was killed around 1920. Eventually, research into the true nature of the Red Wolf began to shed light on many misconceptions. It was learned that red wolves do not hunt in packs, unlike many other wolf species. Therefore, they rarely prey on large mammals, such as deer and livestock. Red Wolves generally hunt alone or in small family groups and they prey mostly on small animals. This finding has helped to relieve the fears of ranchers and farmers. The decline of the Red Wolf has also allowed the coyote to expand its range and come into north Florida in recent years. Unlike the Red Wolf, coyotes do hunt in packs and will kill larger animals. The expanded range of the coyote also interferes with recovery programs for the red wolf. Coyotes and Red Wolves compete for resources, also, the two species can interbreed, producing "hybrid wolves" which reduces the reproductive success of pure Red Wolves.



## BOBCAT

*Lynx rufus*

**General Characteristics:** The Bobcat is a small to medium size cat with a very short tail (the name "bobcat" is because of the short tail). Coat color is varying shades of brown, with dark brown to black stripes and spots. Underside is white with black markings. The tip of the tail and backs of the ears are black. They have short ear tufts and ruffs of fur on the sides of the head. Bobcats have exceptional binocular vision for hunting.

**Habitat:** Bobcats are generally found in pine and deciduous forests, marshlands, swamps, rocky, and bushy areas. They are rarely seen in open plains.

**Range:** Bobcats are found throughout southern Canada and the US. extending southward in Mexico (except the open prairies of the Midwestern US).

**Diet/Feeding:** Bobcats are crepuscular (active mostly at night with peak activity near dawn and dusk) and are carnivores, feeding on a variety of small animals such as rabbits, rats, mice, squirrels, occasionally small deer, and insects. Bobcats hunt by stealth. They rely more on the ability to surprise their prey rather than running it down, often stalking and then leaping on to an unsuspecting animal's back. They are opportunistic feeders and are not always choosy about what they kill.

**Mating/Breeding:** Bobcats are solitary animals except during the mating season. Males and females have small home territories which they patrol and defend. A males territory may overlap with that of many females, but female territories rarely overlap. A male may mate with many females in a mating season. The mating season is in early spring, and kittens are born (usually 3) about 60 days after mating. Kittens are cared for exclusively by the mother and remain with her for about 10 months before leaving to establish their own territory.



## FLORIDA PANTHER

*Felis concolor coryi*

**General Characteristics:** The Florida Panther is a large, long-tailed cat, one of 26 subspecies of cougar, and is highly endangered. Only 30 to 50 Florida Panthers remain in the wild. Coat color is tawny brown with a white to pale gray underside. The tip of the tail, backs of the ears, and sides of the nose are black. Florida Panthers have exceptional vision, hearing, and sense of smell. They are highly territorial, can run at speeds of 30 to 40 miles per hour, and have tremendous jumping ability.

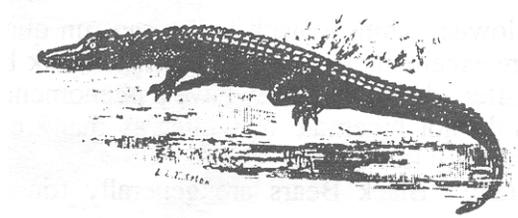
**Habitat:** The Florida Panther's preferred habitats are large, undisturbed plots of pine and deciduous forests, marshlands, and cypress swamps.

**Range:** Historically, the Florida Panther ranged throughout the southeastern US. Now restricted to the area in and around Big Cypress National Preserve, near the Everglades (FL).

**Diet/Feeding:** Florida Panthers are mostly nocturnal and are carnivores. The primary prey item is White-tailed Deer, but they also eat wild hogs, and smaller mammals such as rabbits, raccoons, armadillos, and rats. An individual panther needs about 35 deer annually to survive; a female with young needs twice as many. Florida Panthers chase their prey down at high speeds. Their long tail helps in this pursuit by helping them maintain balance when running (especially when turning).

**Mating/Breeding:** Florida Panthers are solitary animals except at mating time. Males have home territories of 200 square miles on average. Female territories are usually much smaller. A male's territory may overlap with that of many females, but female territories rarely overlap. A male may mate with many females in a mating season. The mating season is from December to February, and kittens are born (usually 2 to 4) about 90 days after mating. Kittens are cared for by the mother, who teaches them to hunt, etc., and remain with her for about 2 years before leaving to establish their own territory.

**Note:** The few remaining Florida Panthers face a variety of problems. Habitat destruction is one of the largest. The Big Cypress-Everglades region is not necessarily prime habitat for the panther, but it is the last large chunk of relatively undisturbed wilderness remaining in its former range. Another problem is that panthers are unable to reproduce without large prey species. Therefore, survival of the panther in the wild may depend in part upon the availability of deer in the Big Cypress/Everglades region. Besides potential food shortages and loss of habitat, other problems facing the panther include automobiles and environmental poisons, like mercury. Perhaps the most serious problem facing the panther is a limited gene pool. The population is so small that all individuals are closely related, and any offspring produced usually have a myriad of birth defects. Breeding programs have met with little success thus far, but studies continue in hopes of saving the Florida Panther.

**AMERICAN ALLIGATOR***Alligator mississippiensis*

**General Characteristics:** American Alligators are large and powerful reptiles. The body is covered by large, hard plates. Males can grow to be over 17 feet long when fully mature (although 12-15 feet is more common) and weigh up to 400 pounds, females generally grow to about half the size of males. The nose and ears have valve-like flaps of skin that can be closed when diving under water where they can remain submerged for 45 to 60 minutes. Whip-like motions of the tail allow for efficient swimming. Alligators are ectothermic, they cannot internally control their body temperature. They bask in the sun for warmth and immerse themselves in the water to cool off.

**Habitat:** American Alligators live at the edges of bodies of water such as rivers, lakes, swamps, and marshes.

**Range:** American Alligators are found throughout the southern US. and southward into Central America.

**Diet/Feeding:** American Alligators are active mainly during the day and are carnivores. Major prey items include fish, turtles, frogs, small mammals, and aquatic birds, but they will usually eat whatever they can catch. Prey is captured in large and powerful jaws which are used to crush and dismember prey. However, alligators cannot chew so prey must be swallowed whole. American Alligators eat about 20 pounds of food per week in warm weather, but may eat little or nothing during the winter, surviving on fat stored in the tail.

**Mating/Breeding:** Mating occurs in open water. Following mating the female alligator heads for shore, where she builds a nest mound of leaves, branches, limbs, grasses and other vegetation which can be over three feet high and seven feet across. A female alligator lays 30-70 eggs per year which hatch about 2 months later (usually around mid-August). Many of the eggs or babies are eaten by predators, but five or six out of each litter usually survive. These young alligators remain with their mother for up to 2 years and grow about 1 foot per year for the first 5 or 6 years, then growth slows considerably.

**Note:** The American Alligator was once highly endangered. Hunting for alligator skins, combined with destruction of wetland habitats brought the species to near extinction. Strict protections were put in place in the 1970's and the species has made an excellent recovery. Limited (licensed) hunting is again allowed in many areas, including Florida.

**BLACK BEAR***Ursus americanus*

**General Characteristics:** The Black Bear is the smallest of the American bear species with an average length (standing on 2 legs) of 5 to 6 feet and weighing up to 450 pounds. They have a heavy body, short tail, and rounded ears. The coat color is usually black but can vary from brown to yellowish-white. Black Bears can run quite fast over short distances, up to 30 miles per hour and are excellent climbers. In fact, the black bear is the only North American bear who can climb trees after adulthood. They have a phenomenal sense of smell, but relatively poor

eyesight. Black Bears do not hibernate in winter as many other species of bears do, although they do become significantly less active.

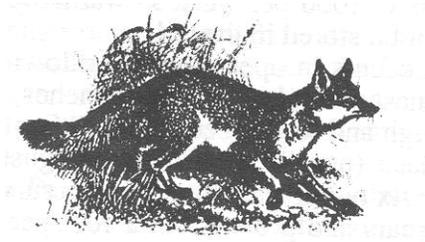
**Habitat:** Black Bears are generally found in pine and deciduous forests, marshlands, and swamps.

**Range:** Historically, the Black Bear ranged from Central Mexico to the Arctic slope of Alaska. Now limited to the remaining deep wilderness areas of North America (mostly national parks).

**Diet/Feeding:** Black Bears are crepuscular (active mostly at night with peak activity near dawn and dusk) and are omnivorous, feeding on berries, nuts, roots, small mammals, bird eggs, insects, honey, and occasionally carrion. Overall, their diet consists of about 75% vegetable matter and 25% animal matter.

**Mating/Breeding:** Black Bears are solitary animals except at mating time. Males have home territories of up to 40 square miles. Female territories are usually much smaller. A male's territory may overlap with that of many females, but female territories rarely overlap. A male may mate with many females in a mating season. The mating season is from May to July, and cubs are born (usually 2 to 3) in January or February. Cubs are cared for solely by the mother and remain with her for about 2 years before leaving to establish their own territory.

**Note:** Habitat destruction has caused the Black Bear to become a threatened species in many areas of the country. In other areas, such as those with large areas of undisturbed public land, these bears are plentiful and limited hunting is still allowed.



## GRAY FOX

*Urocyon cinereoargenteus*

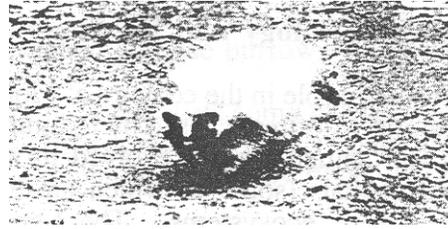
**General Characteristics:** The Gray Fox somewhat resembles a small dog with a bushy tail. The coat is dark gray with broad areas of reddish-brown and a white underside. Gray Foxes are unique among canines in that they are excellent tree climbers. They have strong, hooked claws that allow them to climb rapidly to escape predators or search for food. Gray Foxes are also very territorial. They scent mark their territory, patrol it nightly, and defend it aggressively when necessary. Gray Foxes den in trees or in underground burrows.

**Habitat:** Gray Foxes are generally found in pine and deciduous forests, marshlands, swamps, rocky and bushy areas. They are generally not found in open plains.

**Range:** Gray Foxes are found throughout southern Canada and the US, extending southward in South America.

**Diet/Feeding:** Gray Foxes are crepuscular (active mostly at night with peak activity near dawn and dusk) and are omnivorous, feeding on a variety of small mammals such as rabbits and mice. These foxes also eat birds and bird eggs and supplement their diet with a variety of fruits and berries.

**Mating/Breeding:** Gray Foxes are thought to mate for life, although research is somewhat lacking due to the fact that most mating activities take place within the den (usually underground). Mating occurs in late winter, and after a gestation period of 50 to 55 days, 3 to 7 pups are born. Pups remain with the parents until sexual maturity, then leave to establish their own territory.

**STRIPED SKUNK***Mephitis mephitis*

**General Characteristics:** Striped Skunks are about the size of a domestic cat, and are recognized by their characteristic color pattern. The fur is black with a white stripe that begins on the head, splits into 2 stripes down the back, and reunites back into a single stripe at the tail. There may also be a small white stripe on the face, from the nose to the forehead. Striped Skunks are also known for their scent-spraying defense mechanism. A skunk will usually not spray unless its life is in danger. The skunk's well aimed spray can shoot up to 20 feet, and is a painful irritant to the eyes, nose, and may cause nausea (but has no permanent ill effects). The spray is also used for territorial marking and for communication during mating season.

**Habitat:** Striped Skunks are generally found in fairly open areas, such as the edges of woods, grasslands, and agricultural areas. Skunks spend much of their time in underground burrows, which they may dig themselves or use the abandoned burrows of other animals.

**Range:** Striped Skunks are only found in North America, throughout the US, most of Canada and southward into Mexico.

**Diet/Feeding:** Striped Skunks are active mostly at night and are omnivorous, feeding on a variety of insects, small mammals such as mice and moles, bird eggs, grasses, leaves, fruits and nuts.

**Mating/Breeding:** Striped Skunks are generally solitary animals, with males and females getting together only long enough to mate. Mating takes place in late winter and early spring. 5 to 6 young are born following a gestation period of 60 to 70 days. The young remain with the mother for about 1 year after reaching full size.

### **Reptile Exhibits**

The museum has two reptile exhibits. The first is located next to the main building complex of the outdoor classroom. This display usually contains a variety of poisonous and non-poisonous snakes. There are 45 species of snakes in Florida, but only 6 of these are poisonous;

- Diamondback Rattlesnake,
- Timber (or Canebrake) Rattlesnake,
- Pygmy Rattlesnake,
- Southern Copperhead,
- Florida Cottonmouth (water moccasin),
- Eastern Coral Snake.

There are also a wide variety of non-poisonous snakes such as Rat Snakes, King Snakes, Hognose Snakes, Racers, and Garter Snakes. The Indigo Snake is of special note because it is an Endangered Species. The snakes on display at any given time may vary.

The other reptile exhibit is a small pond and sand habitat, located under the covered walkway behind the main office. The population of this habitat varies also, but usually contains a variety of turtles and baby alligators.

### **Fire Ecology and the Long Leaf Pine**

Fire once played an important role in the ecology of Florida and the Southeastern US. Before colonization by humans, natural wildfires (caused by lightning) would roll across vast areas of the landscape and many plant and animal species evolved in relation to these fires. Therefore, the habitats of many plants and animals (some of which are endangered) are actually

dependent on periodic burning to maintain their ecosystems. The Long Leaf Pine community is one such ecosystem.

The Long Leaf Pine is a large conifer (gymnosperm) which grows in sandy, moist soils in coastal plains, sandhills, swamps, and other areas throughout the southeastern US. It grows very tall (over 100 feet), straight, and has few branches on the lower parts of the tree. This pine has some unusual characteristics. First, it is highly resistant to fire. The outer part of these trees are covered with thick, layered bark which protects them from fire. Secondly, the Long Leaf Pine has an interesting life cycle. The saplings of most trees grow upward very quickly. The seedlings of the Long Leaf Pine sit very low to the ground, in what is called the "grass stage" for 3 to 15 years. During this time the young pine grows a long, thick taproot, reaching far down into the soil and storing nutrients for later growth. The Long Leaf Pine seedling is protected from fire during the grass stage by a thick ball of needles, which surround the actively growing part of the plant, insulating it from fire. Following the grass stage, the Long Leaf Pine has a short burst of growth upwards, bringing the vulnerable parts of the plant up out of fire danger. The tree then continues its slow growth upwards, taking 90 to 100 years to mature. Long Leaf Pines may live up to 450 years under the right conditions. Another interesting characteristic is the growth pattern of the Long Leaf Pine. These trees will not tolerate dense growth. They grow relatively widely spaced from one another, which lets plenty of sunlight reach the forest floor. This allows a wide variety of plant life to flourish in the Long Leaf Pine forest, along with a variety of associated animal species.

Suppression of fires, as well as the clearing of forested lands for the timber industry and for building sites have had far reaching effects on Long Leaf Pine ecosystems. There were once over 80 million acres of Long Leaf Pine forest in the Southeast, but only about 1 percent of that remains today. Periodic fires clear the understory plants from the forest, returning nutrients to the soil, and promoting new growth. Suppression of fire allows encroachment of other plants and trees into the Long Leaf Pine ecosystem, particularly hardwood trees like Oaks and Maples. Hardwood trees grow much more quickly and much more densely than the Long Leaf Pine. This alters the ecosystem in several ways. The canopy of trees soon becomes quite thick, not allowing much sunlight to reach the ground, then the plants and animals that once lived in the understory can no longer survive in this environment. This also eventually chokes out the Long Leaf Pines as well, permanently changing the ecosystem. Long Leaf Pine was highly prized by the timber industry, with each tree yielding thousands of dollars in wood products. However, the slow growth of the Long Leaf Pine made it unprofitable to replant. The forests were replanted with other species of pine, the Loblolly Pine and the Slash Pine, which grow much faster and can be harvested again in 50 to 60 years. These pines do not support the same types of ecosystems as the Long Leaf Pine. They are not nearly as fire resistant and they grow much more densely, leading again to the loss of the understory plants and animals.

Many animal species are affected by the loss of Long Leaf Pine habitats. The highly endangered Red-Cockaded Woodpecker prefers to nest in holes they burrow in the trunks of mature Long Leaf Pines. They can also nest in Loblolly and Slash Pine, but these trees are rarely allowed to grow old enough before they are harvested. It is this loss of habitat that is primarily responsible for the decline of the Red-Cockaded Woodpecker. The Gopher Tortoise, a threatened species, lives almost exclusively in the Long Leaf Pine habitat. The Gopher Tortoise is a large terrestrial tortoise, which digs burrows up to 40 feet long in the firm sandy soil of the Long Leaf Pine forest. It requires a fairly open forest environment and its primary foods are the tender grasses and other plants of the understory. In addition, up to 100 other species of animals

(small mammals and invertebrates) also use Gopher Tortoise burrows for protection from fire, weather, and other purposes.

Only in the latter part of this century have scientists come to understand the importance of fire in natural systems. The benefits of these fires apply not only to Long Leaf Pine forests but to other habitats as well. Foresters now conduct controlled or "prescribed" burns in an effort to preserve fire dependent habitats.

## **SINKHOLES**

Virtually all of Florida was once under the ocean. Therefore, most of Florida's underpinnings are composed of limestone, made of sediments from the shells and remains of ancient ocean animals. This underground limestone is filled with openings, from small spaces to large caverns. Most of these cavities are connected to one another and filled with fresh water. This network of spaces and caverns, filled with flowing water, form the Florida Aquifer, and is the source of all of the fresh water in Florida. We are constantly taking water from the aquifer, slowly draining the spaces and caverns deep underground. In addition, limestone is somewhat soluble in water. Over time the moving water dissolves portions of the limestone, making the spaces larger. These underground cavities are supported by the underground water. If the water level gets too low, the ground above can no longer be supported and may collapse, forming a sinkhole. If the collapsed cavern is empty a dry sinkhole is formed. If sufficient water is still present, a natural sinkhole pond may result.

## **FUNGI**

Fungi were once thought to be plants due to their plant-like appearance. Fungi are multicellular, heterotrophic, eukaryotic organisms with characteristics similar to both plants and animals. However, Fungi are more closely related to animals than plants. Fungi play important roles in ecosystems. Many fungi, along with certain bacteria and protists are responsible for the decomposition of most organic materials on Earth, recycling the nutrients back into the environment. Many types of fungi also have symbiotic relationships with many higher plants, providing plants with important nutrients, such as phosphates.

## **ALGAE**

Algae are relatively simple, mostly aquatic, photosynthetic organisms and are almost entirely dependent on the presence of external water to sustain life functions. Algae lack true leaves, roots, and stems and have no vascular tissues. Nutrients, gases, water, and waste products are exchanged across cell membranes by the process of diffusion.

Algae play an important role in many aquatic ecosystems, often forming the base of the food chain. They are often found in still water and around the bases of Cypress trees.

## **LICHENS**

Lichens are a symbiotic association between fungi and algae (usually green algae). The alga provides the products of photosynthesis to both parties. The fungus provides required nutrients and protection from environments in which the alga otherwise could not live. Lichens have complex structures and function very differently than either the alga or fungi alone.

There are 3 types of lichens:

Crustose lichens - crust-like lichens which adhere very closely to the substrate, such as rock surfaces or tree bark.

Foliose lichens - leaf-like in appearance, somewhat loosely attached to the substrate.

Fruiting lichens - branched, "shrubby" lichens, very loosely attached or free growing.

### **MOSSES**

Mosses are simple land plants that generally grow very low to the ground. They do not have true leaves, roots, stems or specialized vascular tissues (xylem and phloem) and are thus dependent on the presence of external water for many life functions.

Mosses do have primitive leaf-like structures for photosynthesis and root-like extensions called rhizoids which absorb water and minerals. Mosses are usually found near the edges of bodies of water or other moist habitats, such as around the bases of trees.

### **FERNS**

Ferns are seedless vascular plants and represent a major advance in the occupation of land by plants. Ferns have specialized vascular tissues - xylem and phloem. Xylem transports water and nutrients from outside the plant (via roots) for use in photosynthesis. Phloem transports the products of photosynthesis throughout the plant for use in cell processes.

Ferns have true leaves and stems and also have rhizomes, underground stems that give rise to adventitious roots. The leaves of ferns, called fronds, are highly divided and are covered with a waxy cuticle to aid in the conservation of water. These (and other) advances allow vascular plants to grow much larger than more primitive plants and colonize environments farther from water.

### **GYMNOSPERMS**

Gymnosperms are (evolutionarily) the first group of plants to produce seeds. The production of seeds is a tremendous advance for land plants. The outer coating of seeds protects the embryo from the environment, allows for storage of food, and can allow the embryo to lie dormant until conditions are most favorable for continued development. The evolution of seeds (and pollen) also released plants from the requirement of external water for reproduction and other processes.

Gymnosperm means "naked seed". The seeds are exposed to the environment and are usually held in cones. There are generally two types of cones, male and female. The female cones are much larger than the male and produce eggs. The smaller male cones produce pollen (sperm). Pollen is carried from the male cones by wind. Commonly recognized gymnosperms includes conifers such as pine, cypress, cedar, and fir.

### **Pond Cypress**

Pond Cypress (*Taxodium ascendens*) is a wetland conifer (gymnosperm) common to southern swamps. Cypress trees are unusual among gymnosperms in that they are deciduous (lose their leaves periodically, usually in winter). Most gymnosperms are "evergreen". The fallen leaves of Cypress trees release tannic acid into the water of the swamp, producing the characteristic brown, "tea-like" color of the water. Cypress trees are perhaps best known for the distinctly broadened bases of the trunk with "knees". Cypress knees are projections of the roots

that grow above the soil. The biological function of the knees is unknown, but it is thought that they provide extra support for the tree in its aquatic environment.

## ANGIOSPERMS

Angiosperms are flowering plants and are the most advanced, successful, and abundant plants on Earth. They have highly developed roots, stems, and leaves, as well as a highly efficient system of vascular tissues.

Characteristic of angiosperms is the production of reproductive parts in flowers and enclosed seeds. The production of flowers has many advantages over more primitive methods of reproduction. Angiosperms do not need to rely on wind alone for the distribution of pollen (as gymnosperms do). Flowers attract a wide variety of other pollinators such as insects, birds, and mammals. Having seeds enclosed in fruit also has advantages. Relatively large amounts of food for the embryo can be stored, and the appeal of fruits to animals can increase seed dispersal. These and other advances have allowed Angiosperms to colonize virtually any habitat. Angiosperms are divided into 2 classes, monocots and dicots, based on differences in the structure of flowers, leaves, arrangement of vascular tissues, and embryos (within seeds).

### **Black Gum**

Black Gum (*Nyssa biflora*) is a common neighbor of the Pond Cypress, usually found in the same swamps. Although unrelated to the cypress, this tree also has a distinctly broadened base of the trunk, presumably for added support in an aquatic environment.

### **Live Oak**

The Live Oak (*Quercus virginiana*) is a large oak with a broad trunk and massive arching limbs. It is one of 19 species of oak native to Florida and is common throughout the south. At one time the Live Oak was in danger of disappearing. The trees were cut down in huge quantities and the large limbs were used to build the ribs of ships.

### **Spanish Moss**

Spanish Moss (*Tillandsia usneoides*) is often seen hanging from the branches of Live Oaks. Spanish Moss, which is not actually a moss, is an Epiphyte or "air plant". Epiphytes are not rooted in the soil like most plants. They live above ground on the stems and branches of other plants. Epiphytes do not harm their host plants, they use them only for physical support. Spanish Moss is an angiosperm and is in fact a close relative of the pineapple.

### **Saw Palmetto**

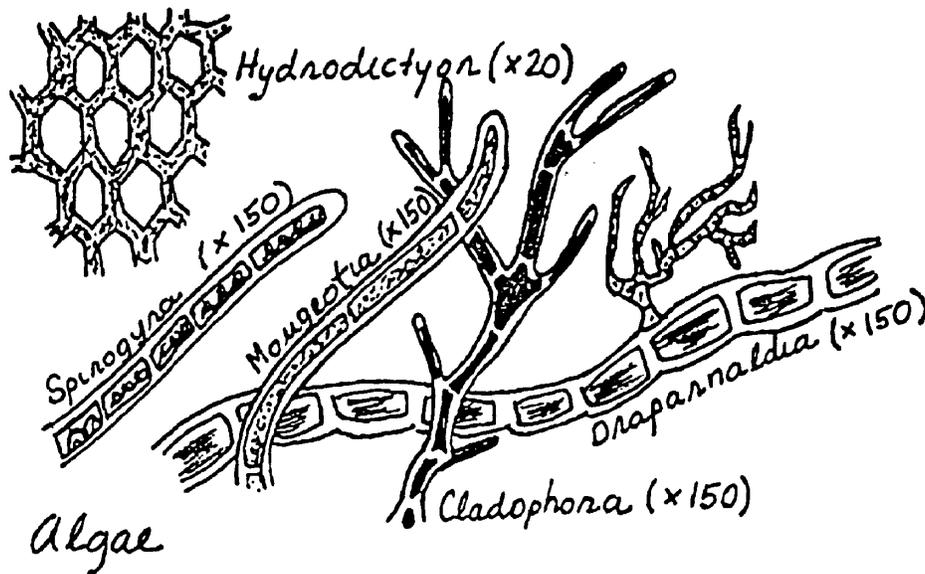
Saw Palmetto (*Serenoa repens*) is a small, hardy palm that is native to Florida and other southern states, and is a common resident of swamps. The stem usually remains underground, only the leaves are visible. The cluster of fan-like leaves usually grows to about 4 to 6 feet high. The petioles of the leaves have "saw-tooth" projections and are quite sharp. This plant has fairly specific moisture requirements and is usually found at a characteristic distance range from the edges of bodies of water. The plant and its berries provide cover and food for a variety of animal

species. In addition, proponents of alternative medicine use the extract of Saw Palmetto berries as a treatment for an enlarged prostate gland. It is also used in treating ovarian cysts and symptoms of menopause.

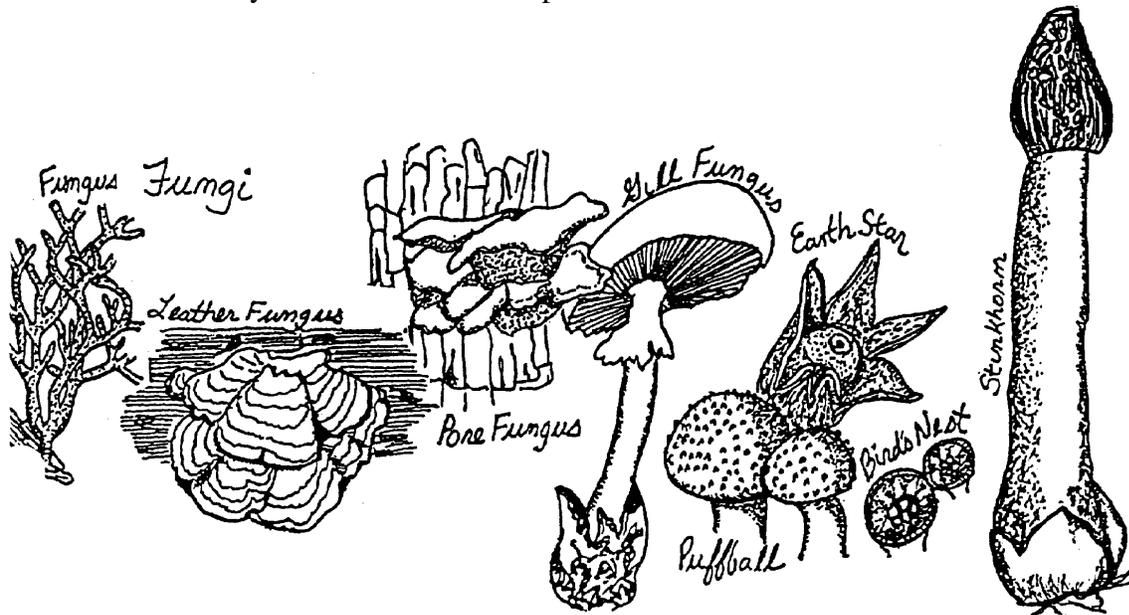
## Appendix B

### Key to Plant Identification

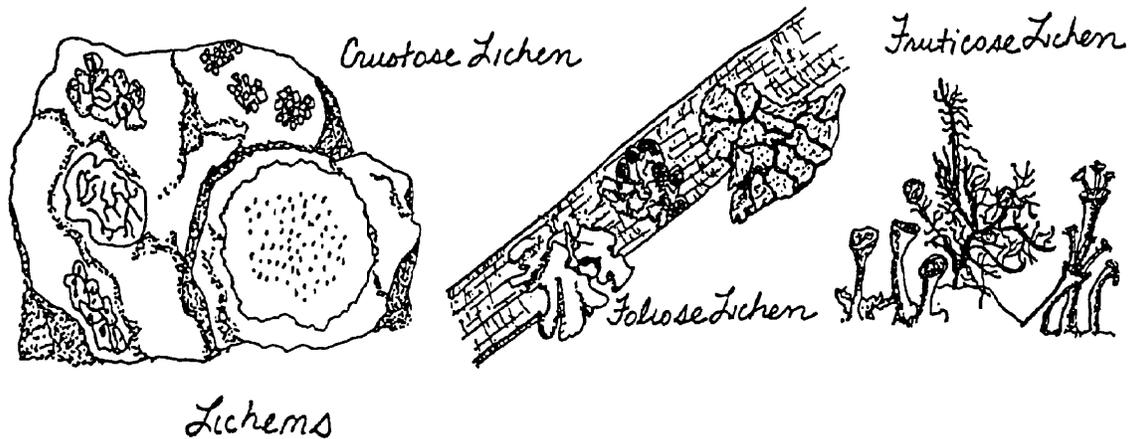
**Algae** are aquatic plants which occur as single cells, filaments and as large plants, such as the giant kelps. The most common group in a swamp ecosystem is the green algae, which form the characteristic green scum in still waters. Green algae may be found floating free, attached to the bottom, or clinging to submerged objects. Several common green algae are illustrated below, although identification is difficult without the aid of a microscope.

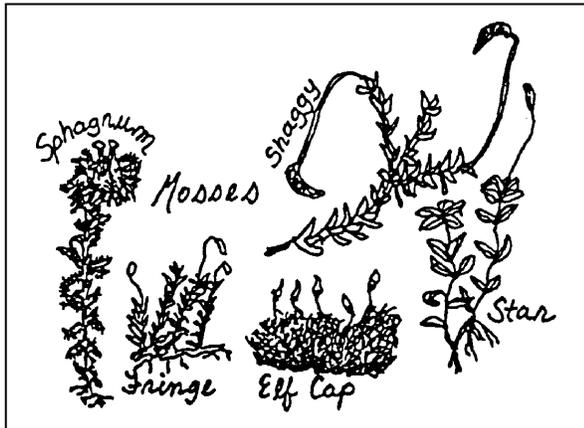


There are several thousand species of **Fungi**, but the most familiar example is the mushroom. All fungi, except for the few single-celled forms, are composed of masses of filaments, or **hyphae**, that form a sort of root system, or **mycelium**, that is usually hidden beneath the surface of the substance on which the fungus lives. The structures that we see protrude above the surface and are actually reproductive structures containing spores. Fungi obtain energy as **saprophytes**, which means they absorb nutrients from dead or decaying matter, or as **parasites** by feeding directly from a live host. For this reason, they are not classified with plants but are included because they are common in most plant communities.

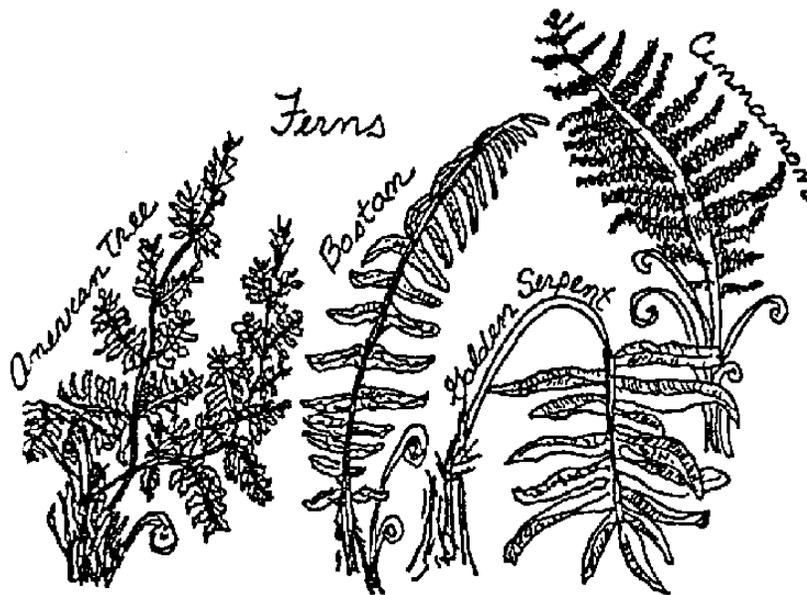


A **Lichen** is a combination of an algae and a fungus. Unlike algae, they can survive in a non-aquatic environment; unlike fungi, they do not require an organic food source. This is an example of a **symbiotic** relationship, which is an intimate association between two or more organisms of different species. Lichens are found on rocks, tree trunks, and even bare soil. In the swamp you can find three different types of lichens- crustose (crusty), foliose (leaf-like), and fruticose (shrubby). These types of lichens are illustrated below.

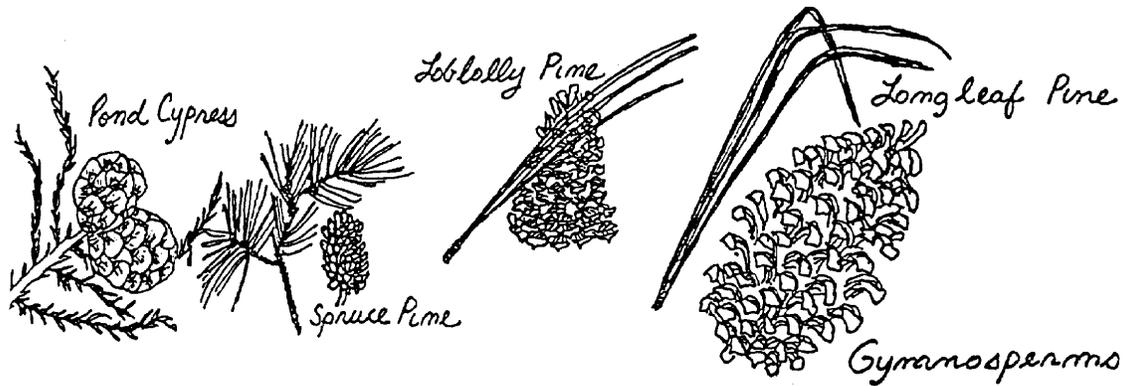




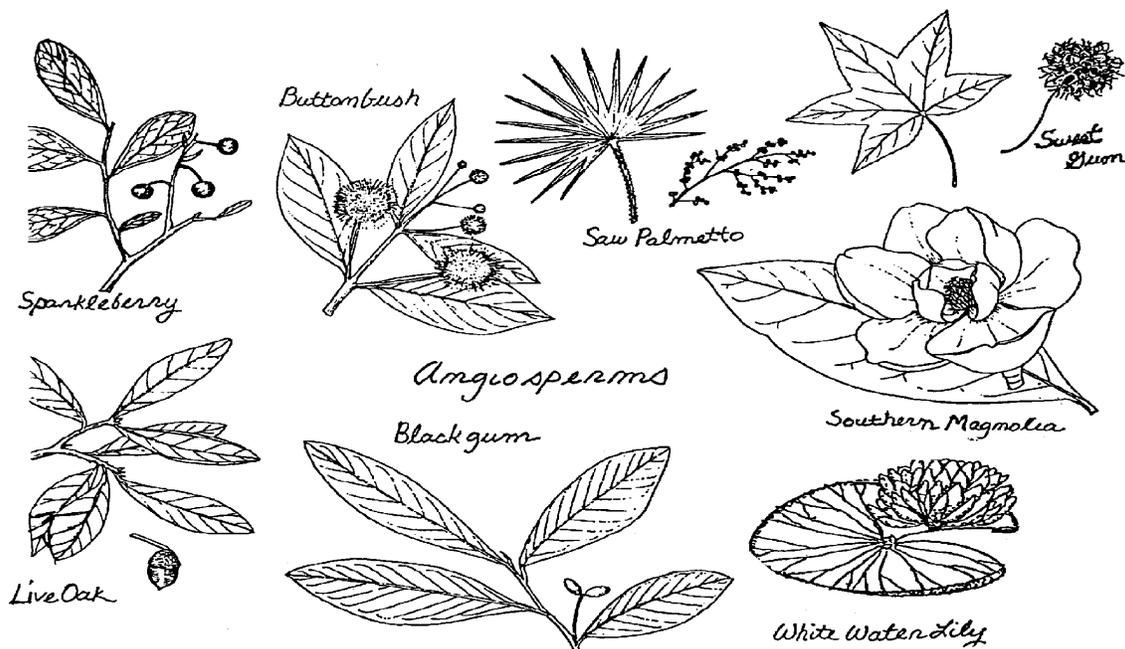
**Mosses** are small plants composed of minute, leafy stalks. They lack true roots and stiff support structures so they depend on the presence of water for growth and reproduction. They are usually found in moist, shady places although identification is difficult without a hand lens.



**Ferns** can be recognized by their flat, feathery leaves extending from a central stalk. Fern leaves, or **fronds**, typically arise from curled structures, or **fiddleheads**. While not restricted to moist substrata, ferns grow most successfully in environments where water is readily available.

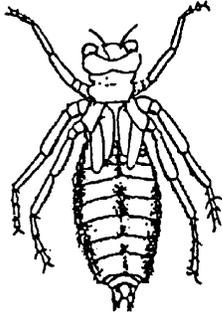


**Gymnosperms** are a large group of plants characterized by needle-like leaves, conspicuous cones, and “naked” seeds which do not develop within fruits. Most gymnosperms are **evergreen**, although a few, such as the pond cypress, are **deciduous** and shed their leaves during a portion of the year. Examples of gymnosperms are found throughout the swamp ecosystem and in nearby environments.

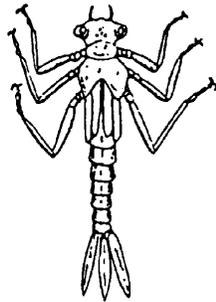


**Angiosperms** form the largest group of land plants and can be distinguished from other plants by the presence of flowers and fruits which enclose the seeds. There is a wide variety of angiosperms in the swamp ecosystem. A few of the more common plants are illustrated here.

Appendix C  
Key to Animal Identification



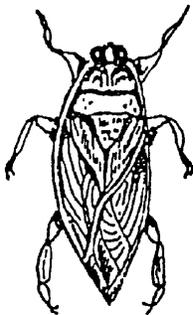
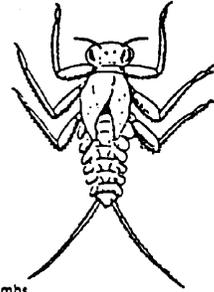
Dragonfly nymph



Damselfly nymph



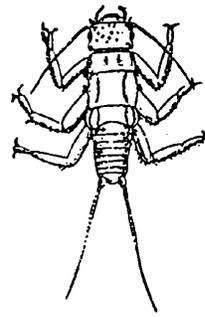
Mayfly nymphs



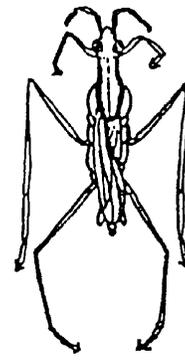
Belostoma sp.  
Giant water bug



Caddisfly larva



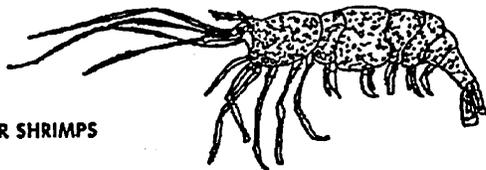
Stonefly nymph



Gerris sp.  
Water strider

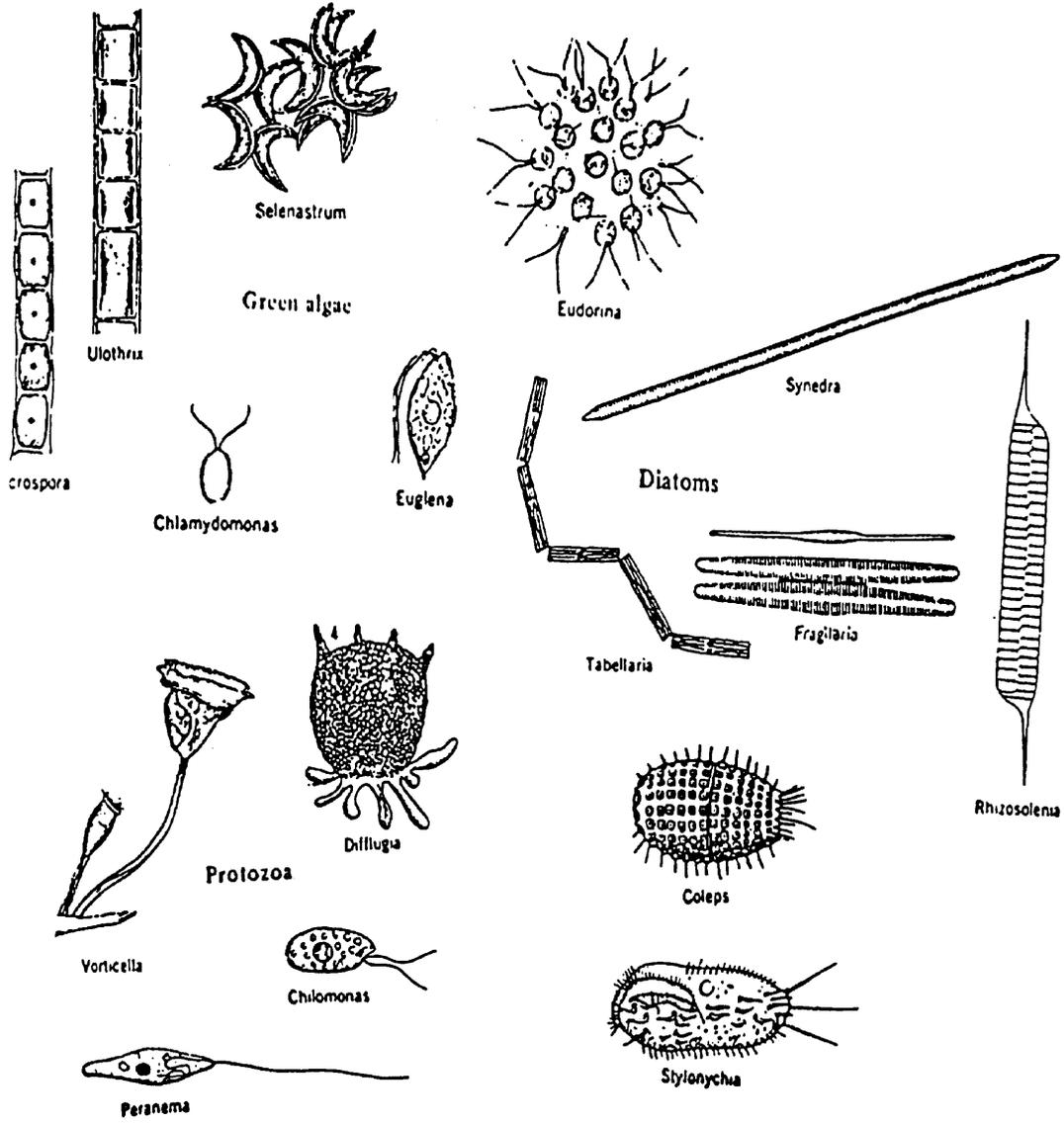


CRAYFISH



FRESH-WATER SHRIMPS

### Key to Animal Identification



### Key to Animal Identification

