



The Florida Museum of Natural History is Florida's state museum of natural history. The Museum is dedicated to understanding, preserving and interpreting biological diversity and cultural heritage.



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This Educators' Guide to Northwest Florida: Waterways and Wildlife was produced by the Florida Museum of Natural History with the support from the Institute of Museum and Library Services.

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We would like to thank the Institute of Museum and Library Services for their support.

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www.flmnh.ufl.edu/education



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**The Florida Museum of Natural History's Educators' Guides**, in combination with ongoing teacher workshops and field trips to its permanent and temporary exhibitions, will help you structure learning experiences that correspond to the following Florida Sunshine State Standards. All guides contain materials and online resources to supplement and enhance student learning in the classroom and during in-gallery experiences, tying Museum exhibits to the state standards and enhancing school fieldtrips.

#### **Language Arts**

#### Reading Standard 1:

The student uses the reading process effectively

#### **Reading Standard 2:**

The student constructs meaning from a wide range of texts.

#### **Writing Standard 1:**

The student uses writing processes effectively.

#### Writing Standard 2:

The student writes to communicate ideas and information effectively.

#### Listening, Viewing and Speaking Standard 1:

The student uses listening strategies effectively

#### Listening, Viewing and Speaking Standard 2:

The student uses viewing strategies effectively.

#### Math

#### Measurement Standard 1:

The student measures quantities in the real world and uses the measures to solve problems.

#### Data Analysis and Probability Standard 3:

The student uses statistical methods to make inferences and valid arguments about real-world situations.



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#### **Science**

#### Processes that Shape the Earth Standard 1:

The student recognizes that processes in the lithosphere, atmosphere, hydrosphere, and biosphere interact to shape the Earth.

#### Processes that Shape the Earth Standard 2:

The student understands the need for protection of the natural systems on Earth.

#### Processes of Life Standard 1:

The student describes patterns of structure and function in living things

#### How Living Things Interact with Their Environment Standard 1:

The student understands the competitive, interdependent, cyclic nature of living things in the environment.

**How Living Things Interact with Their Environment Standard 2:** | The student understands the consequences of using limited natural resources.

**The Nature of Science Standard 3:** | The student understands that science, technology, and society are interwoven and interdependent.

#### **Social Studies**

**Time, Continuity and Change Standard 1:** | The student understands historical chronology and the historical perspective.

**Time, Continuity and Change Standard 6:** | The student understands the history of Florida and its people.

**People, Places and Environments (Geography) Standard 1:** | The student understands the world in spatial terms.

**People, Places and Environments (Geography) Standard 2:** | The student understands the interactions of people and the physical environment.

#### **The Arts: Visual Arts**

**Cultural and Historical Connections Standard 1:** | The student understands the visual arts in relation to history and culture.

**Applications to Life Standard 1:** | The student makes connections between the visual arts, other disciplines, and the real world.

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Florida Museum of Natural History

Exhibit Introduction

This exhibit follows water as it flows through Northwest Florida habitats, from limestone caves and springs to the Gulf of Mexico. All living things are interconnected. The physical environments and the plants and animals in them, all interact to form the many ecosystems that make up Florida and our planet. Explore a hardwood hammock featuring a life-sized limestone cave, a seepage bog with its carnivorous plants, a Prehistoric Native American trading scene and more.



Entrance to the cave in the Northwest Florida Permanent Exhibit

Content Discussion: Interrelated Ecosystems

Nature is like a puzzle. The pieces of natural systems fit together; no piece can exist in isolation. All living things need energy to survive. The sun is the source for most of this energy. During photosynthesis, plants absorb the sun's energy. Animals breathe oxygen, the waste product released by plants during photosynthesis. Plants also transform light energy into a sugar called glucose, which serves as energy for numerous animals as it passes from one organism to another along a food chain. Green plants produce the food. Herbivorous animals eat the green plants. Carnivorous animals eat the herbivores and other carnivores. Decomposers (saprovores) consume dead plants and animals. The network of interconnections in an ecosystem is very complex. If one species declines, many others are likely to be affected.







Green plants

Carnivores

Herbivores

The same principles of interconnectedness are true with aquatic systems. All sources of water are connected through the water cycle. Therefore, if one source is polluted, diminished or otherwise affected, all other sources will also be influenced. In addition, plants and animals that live in the water or depend on particular water sources for survival will change, in turn affecting food chains and food webs.

**Fun Fact:** Northwest Florida, frequently called the Panhandle because of its shape, has the greatest variety of native plants and animals of any region in the state. Many plants and animals reach the United States' southern limit of their ranges here. Some occur only in the Panhandle.



### PART ONE: NORTHWEST FLORIDA: WATERWAYS AND WILDLIFE EXHIBITION



Florida Museum of Natural History

Section One: Hammock 8

#### Introduction

Hammocks are diverse hardwood forests. North Florida hammocks have the greatest number of tree and shrub species per acre of all temperate forests in the continental United States. They provide homes for other plants and animals. Some of these species occur nowhere else in the world. People in Florida have long enjoyed hammocks as cool, shady, places for walks, picnics, and homesteads.

Elevation, along with organic matter and soil moisture determines the type of plants that can grow in a particular hammock. There are three types of hammocks: hydric hammocks are wet; xeric hammocks are dry; mesic hammocks are in-between. One can remember these by looking at the roots of the words. Hydro means water, therefore hydric hammocks have a lot of water. Meso means middle, therefore mesic hammocks are in between wet and dry and xeric means dry.

Within the hammock ecosystem, there are three zones: **Uplands**, **bluff** and **floodplain**.



Hammock inhabitants

The **uplands** are areas of higher ground. These habitats usually have well drained soil, and therefore are home to more xeric species. Upland habitats are often governed by fire, so plants and animals living there have adaptations that help them to survive brush fires.

A **bluff** is formed when plant roots grow into small cracks in the rock and down into the floodplain soils. As the roots grow they split the rock further and soil fills the cracks, providing homes for ferns and other resilient plants. Plants both hold the bluff together and break it apart by clinging to tumbled boulders and rocky edges.

**Floodplains** are low areas along the edges of rivers and streams. The trees here slow floodwaters, which allows the water to seep into the ground. Floodplain trees have special features to survive floods such as extensive root systems that grip the soil. Floodplain plants also trap organic sediments that enrich the floodplain soils with nutrients needed by plants.

Currently, logging, land development, and pollution threaten floodplain forests. It is essential that we preserve Florida's floodplains in order to prevent property damage caused by floodwaters, provide valuable habitats for wildlife, and create rich soils.

**Fun Fact:** A floodplain can contain 100 or even 1000 times as many species as a river.

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Section One: Hammock continued

### **Vocabulary Words**

Bluff: A high steep bank or cliff.

**Canopy:** The uppermost layer of a forest that consists primarily of the tops of trees, vines and epiphytes.

**Epiphytes:** A plant that grows on top of another plant, but does not depend on it for nutrients.

**Floodplain:** Low areas along the edges of rivers and streams that are covered with sediment due to frequent flooding.

**Hammock:** An "island" of primarily hardwood trees growing on an elevated site. These trees are surrounded by vegetation characteristic of lower, wetter surroundings.

Hardwood Forest: A forest made of primarily hardwood trees, such as oak, poplar, holly and magnolia.

Hydric: A term used to describe an environment that is extremely wet.

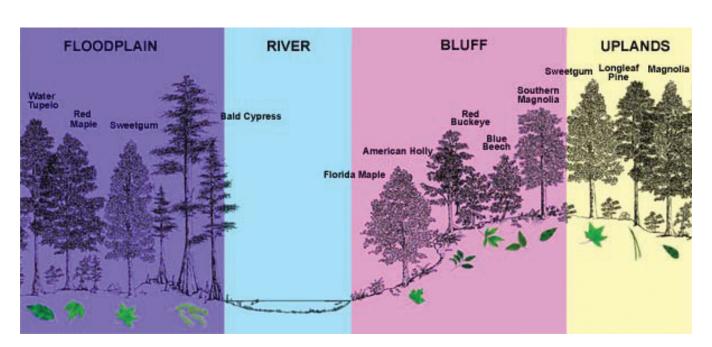
**Mesic:** A term used to describe an environment that has moderate moisture.

**Temperate:** A climate that has a range of moderate temperatures.

**Understory:** A layer of small trees and shrubs below the level of taller trees in a forest.

**Uplands:** Areas of higher ground with well-drained soil and xeric species of plants.

**Xeric:** A term used to describe an environment that is dry.



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Section One: Hammock continued 10

#### **Guiding Questions and Answers**

#### 1) What happens to the tree and the forest when a tree dies?

Organisms called decomposers (such as fungi, certain insects, and bacteria) live in decaying wood. When plants and animals die, their bodies break down into sugars and other nutrients. Decomposers extract those nutrients from dead organisms.

Carpenter ants, termites, and wood roaches are a few of the many insects that inhabit fallen trees. Scorpions, squirrel tree frogs, and southeastern five-lined skinks hide under the bark and eat the insects. Bess beetles create tunnels as they eat their way through dead wood. Decomposers such as bacteria and molds enter the tunnels and penetrate deep inside the log. This speeds the breakdown of wood into useable nutrients.



Decaying wood

#### 2) Where do animals live in a hammock?

Animals live throughout the forest layers. Some species spend most of their time in only one or two levels, while others use all levels.

The leafy crowns of the largest trees form a canopy more than 50 feet high. This dense canopy shuts out most of the sunlight other plants need for photosynthesis. Only shade-tolerant plants can survive under the canopy to form an understory. The different levels of the hammock range from the top of the canopy, to underground and everywhere in between.

Some plants use other plants to help them reach the light. Vines root in the soil but climb up other plants to reach sunlight. Greenbriars and grapevines cling to trees with tendrils; poison ivy attaches to tree bark with small, densely branched roots. Resurrection ferns and Spanish moss grow directly on larger plants. These epiphytes absorb nutrients from dew and wind-blown dust and debris.



Levels in a hammock range from the top of the canopy, to the underground.



Section One: Hammock continued

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#### **Pre Activity**

The Water Cycle: All ecosystems are connected with the water cycle.

#### **Materials**

- •Clear aquarium with lid
- •Clay
- •Water
- •Petri Dish
- •Ice
- •Lamp

#### Set Up:

- •Form a mountain out of the clay and place it on one side of the aquarium.
- •Fill the aquarium with water so that the mountain is about ¼ covered. Cover the aquarium with a lid.
- •Place the Petri dish on the lid above the area where the mountain is located.
- •Fill the Petri dish with ice.
- •Place a lamp so that it is shining over the open water.

#### Actions:

- •Begin by discussing the water cycle and its process (condensation, precipitation, evaporation, transpiration, percolation). Give students the hand out to show the cycle.
- Have students observe the aquarium and record their observations.
- •Discuss what they observed:

Which part showed evaporation?

• Evaporation was shown as the open water (ocean) was heated by the lamp.

Which part showed condensation?

• Condensation occurred as the evaporated water from the ocean cooled on the lid near the Petri dish of ice.

Which part showed precipitation?

• Precipitation occurred as the drops of water from the lid became large and heavy enough to fall.

What parts of the water cycle are not represented in this experiment?

• Transpiration and percolation are not shown in this experiment.

How can we show transpiration in this activity?

• If we added live plants to the aquarium, there would be a source for transpiration as the plant absorbed the water in the open water and released it into the air through its leaves.

Does the world ever lose water in the water cycle?

• No. Water is continually recycled through the various parts of the water cycle.

There is always the same amount of water on Earth; it is just always changing in form.



Section One: Hammock continued

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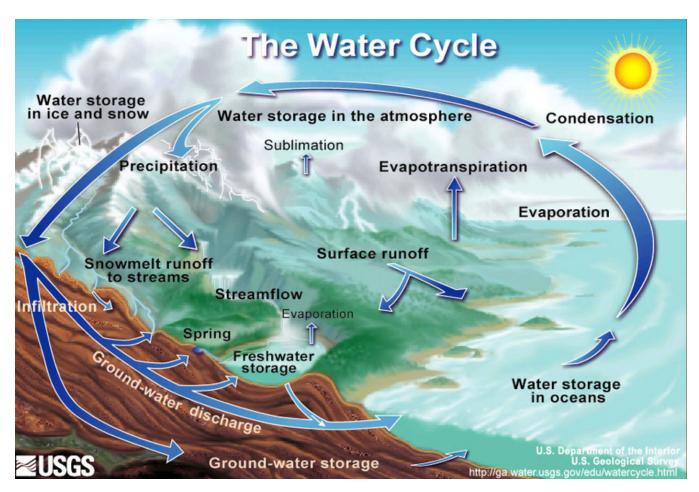
#### **Handout**

**Evaporation:** The changing of water from a liquid to a vapor when water is heated. You can show this by heating water on an electric hot plate. There is steam that rises from the pot. Eventually, the water level in the pot will decrease.

**Precipitation:** Water molecules condense and become heavy enough to fall to Earth's surface. This happens in the form of rain or snow.

**Transpiration:** The process of water traveling through plants from roots to leaves where it changes to water vapor and is released into the air.

**Condensation:** The changing of water from a vapor to a liquid. An example of this is after someone has taken a hot bath or shower, condensation forms on the mirror. Steam (water in vapor form) condensed to liquid form on the cooler mirror surface.



The Water Cycle.: Picture from USGS website, Science for a changing world.

# PART ONE: NORTHWEST FLORIDA: WATERWAYS AND WILDLIFE EXHIBITION



Section One: Hammock continued 13

#### **Field Trip Activity**

- Make sure to look under the logs. What types of critters live in and under the log? How do students think that these animals help the hammock? They decompose the dead tree and allow it to help fertilize new growth.
- Look for the animals that live in the different layers of the hammock. There is a field guide in the exhibit to help you look.
- Where do you see water? How did it get there? What parts of the water cycle do students see within the exhibit?

#### **Post Activity**

Food Chain: All animals within an ecosystem are interconnected through food chains.

#### Action:

- · Assign each student one of four roles: plant, insect, omnivore, and carnivore. Give each group a card that corresponds to their role. This is so that other students can identify them. There should be more plants than insects, more insects than omnivores, and more omnivores than carnivores.
- · Each insect needs two plants to survive, each omnivore needs either two plants, two insects or one of each to survive, each carnivore needs two omnivores to survive.
- · Play the game out like tag to see if everyone survives. After all the "food" available has been captured, assess if everyone had enough to survive. If there is someone that did not, they should sit out for the next round. Keep going until there are not many survivors left.
- · Alter the number of each role to see how it affects the survival of all creatures. Water pollution or human in and around their houses reduce the number of insects available. Farmers protecting their livestock reduce the number of carnivores.
- Try adding a "safe base" that represents a specific habitat that animals would utilize to help protect them from predators. To keep the game moving, put a limit on the number of people that can be on safe at any time or enforce a time limit. If they stay too long, they "starve to death" because they did not find enough food in time.
- · After playing out numerous situations, return to the classroom to discuss what happened:

What happened when there were not many plants?

What happened when there were not many insects?

What happened when there were not many carnivores?

What happened when there was a safe base?

Section Two: Cave

#### Introduction

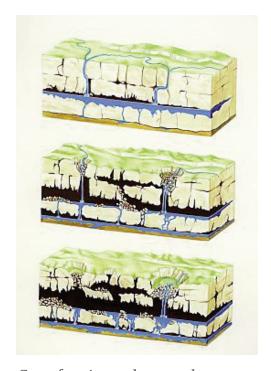
Caves form when groundwater fills limestone cavities.

This groundwater is weakly acidic and slowly dissolves the limestone by a chemical process called dissolution. Later, water drains out and the cave fills with air

http://www.dkimages.com/discover/Home/Science/Earth-Sciences/Geology/Landform-Evolution/Caves/Formation/Formation-4.html

**Groundwater** is water that accumulates in soil and rock and is a valuable source of drinking water. The surface of the groundwater is called the **water table**. An **aquifer** is the soil and rock that holds groundwater. The primary aquifer for most of our state is the Ocala Limestone, commonly called the **Floridan Aquifer**.

Caves can be dangerous, and visitors can easily damage fragile cave formations and disturb wildlife. You can safely visit a cave, open to the public, at Florida Caverns State Park in Marianna. The Florida Museum of Natural History has a life size replica of this natural wonder.



Caves forming underground

Green plants cannot live in caves because they need sunlight for **photosynthesis**. Since animals depend, directly or indirectly, on green plants for food, their numbers decrease dramatically the deeper you go into the cave.

**Troglophiles** are animals that regularly inhabit caves. They also can live in dark, damp habitats outside of caves. An example is a raccoon or bat. Cave visitors **(trogloxenes)** are animals that normally live outside of caves. They occasionally enter caves or live around cave entrances. Some trogloxenes use caves as temporary or winter shelters. An example of a trogloxene is a beetle. **Troglobites** are animals that only live in caves. They have special adaptations such as sensitivity to light that make it impossible for them to survive outside of the cave. Examples are cave fish or a cave salamander.

**Fun Fact:** The longest cave system is Mammoth Cave located in Kentucky. It is 367.2 miles in length. The deepest cave known is Voronya Cave in Abkhazia, Georgia with a depth of 1.3 miles.

### PART ONE: NORTHWEST FLORIDA: WATERWAYS and Wildlife Exhibition



Section Two: Cave continued 15

#### **Vocabulary Words**

Aquifer: A layer of porous rock, sand, or gravel through which groundwater flows.

Column: A type of speleothem that occurs when a stalactite and stalagmite reach each

other or a stalactite reaches the cave floor.

Dissolution: The separating, decomposing, or disintegrating of something into smaller

or more basic constituents.

**Echolocation:** The process of locating an object using an emitted sound and its reflection back.

**Flowstone:** A type of speleothem that forms from flowing water.

**Guano:** The droppings of birds, bats, and seals.

**Groundwater:** Water held underground in soil or porous rock.

**Insectivorous:** A term used to describe animals that feed on insects.

Photosynthesis: The process by which green plants convert carbon dioxide and hydrogen into simple

carbohydrates using light as an energy source.

Predator: A carnivorous animal that hunts, kills, and eats other animals in order to survive.

Scavenger: An animal that feeds on dead and rotting flesh or discarded food scraps.

**Speleology:** The study of caves.

**Speleothem:** Cave formations.

**Stelactite:** A type of speleothem that forms from water seeping through the cave roof.

Stelagmite: A type of speleothem that forms from dripping water from the cave roof.

Troglobite: An animal that lives solely in caves. They have adaptations that do not allow them to

leave the cave environment.

Troglophile: An animal that regularly lives in caves but is also found in dark, damp areas outside of caves.

**Trogloxene:** An animal that normally lives outside of caves but will occasionally live near cave entrances.

Water table: The upper surface of groundwater.



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Section Two: Cave continued

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#### **Guiding Questions and Answers**

#### 1) What are some examples of cave-dwelling animals? What are some of their adaptations for cave-life?

Few animal species live in caves, relative to the numbers that live in surface environments. But cave animals are uniquely adapted to living in an environment with little or no light and a limited food supply. Each species lives in distinct zones defined by variations in temperature, humidity, and the amount of light. Cave animals are grouped by the amount of time they spend in caves.

Cave dwellers (troglobites) live only in caves. Their bodies have adapted to the dark. Troglobites are often colorless since they don't need camouflage colors in the dark nor any pigment to protect them from the sun. Their legs, feelers, and eyestalks are longer than those of their relatives outside the cave, magnifying their senses of touch, taste, and smell.

In Florida, there are 26 known troglobites. Most have very limited distributions and many live in only one cave system. The Apalachicola cave crayfish (*Cambarus cryptodytes*) and the cave salamander (*Haideotriton wallacei*) live only in Chipola River area caves and caves in southwestern Georgia. Three of Florida's bat species regularly live in Panhandle caves: gray bats (*Myotis grisescens*), southeastern bats (*Myotis austroriparius*), and eastern pipistrelles (*Pipistrellus subflavus*). Gray bats and southeastern bats roost in mixed colonies in heat-collecting domes in the ceilings of caves. Eastern pipistrelles, Florida's smallest bats, are solitary mammals and roost on the cooler cave walls. As many as 50,000 to 100,000 bats can inhabit a single cave.

All Florida bats are **insectivorous.** They eat moths, mosquitoes, beetles, and other flying insects. They are also the only mammals that truly fly. Bats are not blind. They are able to fly and capture prey at night aided by **echolocation** and vision. Bats emit a high-pitched sound that bounces off objects and returns information as an "echo" to the bat. A single gray bat may eat 6,000 insects in a night.

Many bat populations have declined over the last several decades. The gray bat declined by 50%, mostly due to loss or disturbance of caves. Many species also suffer severely from pesticides and habitat destruction outside the cave.

Most animals of the deep cave are scavengers, feeding on dead plant and animal matter. Some eat cave bacteria adapted to growth without sunlight. A few deep cave dwellers are predators and eat smaller cave animals. Apalachicola cave crayfishes (*Cambarus cryptodytes*) are scavengers that live in pools under bat roosts. They eat bat guano that consists mostly of dead insects. Sometimes crayfish eat bats that fall into the water and drown. These blind scavengers use their long legs, antennae, and other sensory organs to locate food in the pool.



Florida Gray bat

Section Two: Cave continued

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The Georgia cave salamander (*Haideotriton wallacei*) is a predator without functioning eyes and no pigment. It eats small aquatic crustaceans and insects that it locates by sensing vibrations. The salamander also may eat microorganisms that live in the fine-grained mud on the bottom of cave pools.

#### 2) What are the different cave formations? How is each one created?

Rainwater percolates down through the soil and limestone into the air-filled cave. As it moves, the water dissolves tiny quantities of limestone. The water re-deposits the minerals from the limestone on the ceilings, walls, and floors of the cave in formations called speleothems. Speleothems take various forms, depending on whether the water drips, seeps, condenses, flows, or ponds.



Georgia Cave Salamander

Stalactites are pointed mineral deposits that hang from the cave ceiling. They are formed from ground water that seeps through the cave roof. Some specific types of stalactites are soda straws and chandeliers. Soda straws are stalactites that have an extremely long and elongated shape while chandeliers are clusters of stalactites.

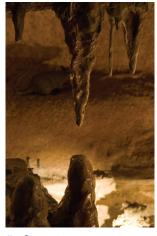
**Stalagmites** are mounds of mineral deposits found most often underneath a stalactite. Stalagmites are formed from the ground up by water and minerals that drip from the cave roof or off the end of a stalactite.

**Columns** form when stalactites and stalagmites meet or a stalactite reaches the floor of the cave.

**Draperies** and bacon are specific examples of **flowstone**, which is formed by the deposition of minerals as water flows through the cave. Draperies are thin wavy pieces of stone that hang from the ceiling. Bacon looks the same as draperies but is characterized by alternating bands of color. Stone waterfalls as its name suggests look like waterfalls frozen in time.



**Stalactites** 



**Stalagmites** 



Columns



**Draperies** 

Section Two: Cave continued

#### 3) How have humans used caves in Florida?

For centuries people have visited caves. Some panhandle caves have provided shelter, resources, and refuge for many different people. Caves have served as temporary shelters or hunting camps for thousands of years. In one Marianna cavern, prehistoric people took clay to make pottery. They left behind their footprints.

Later, pioneers settled near caves and springs. Caves provided water, shelter, and cave earth (potassium nitrate) to make gunpowder. Local lore often associated caves with superstitions and myths, inspiring names such as Devil's Den and Hell Hole.



"During Andrew Jackson's punitive expedition against the Seminoles in 1818, it is believed a large band of Indians escaped by concealing themselves in the underground passages... Again, during the raid by the Federals on Marianna in 1864, women, children, and slaves are said to have taken refuge in the caves while the battle raged..."

(Stanley, J.R. 1950. History of Jackson County. p. 13)

**Speleology** is the study of the geology and biology of caves. Speleologists are scientists who investigate the cave and its unique features. Spelunkers are cavers who explore caves as a hobby. Together, scientists and cavers frequently collaborate to make new scientific discoveries.

Cave exploration can be dangerous. Responsible cavers learn about safety rules, procedures, and equipment. They minimize the impact of their presence on these fragile environments. Damage to cave formations caused in a moment can last for centuries.



Cave inhabitants





**Speleologists** 

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Section Two: Cave continued 19

#### **Pre Activities**

**Stalactites and Stalagmites:** Stalactites and Stalagmites are two of the most well known types of speleothems caused by water seeping and dripping from the cave's roof.

#### **Materials:**

- 2 glasses of hot water
- Epsom salt
- 1 cotton thread
- 1 plate

#### **Actions:**

- Fill the 2 glasses with hot water.
- Dissolve as much Epsom salt as possible in the water.
- Place the ends of the thread in each of the 2 glasses.
- Position the plate between the two glasses.
- The salt water should travel along the thread and drip from the lowest point in the middle onto the plate.
- If this happens slowly enough and the surroundings are warm enough, evaporation at the thread and at the plate brings about the formation of crystals, which resemble stalactites and stalagmites.

**Identifying Limestone:** Caves form in areas where the ground is primarily limestone.

#### **Materials:**

- Sea shells
- Natural chalk
- Calcite
- Marble
- Ordinary rocks
- Safety goggles for each student
- · Lemon juice
- Vinegar
- Eye droppers
- Pictures of statues of buildings that have been eroded by acid rain



Florida Museum of Natural History

Section Two: Cave continued

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#### **Actions:**

- While wearing the safety goggles, mix all of the above solid items together.
- Ask students to identify the limestone samples by testing them with the acid solution of vinegar or lemon juice.
- Wearing safety goggles, have the students put a few drops of the acids on the rocks with an eyedropper
- Students should listen for a fizzing sound. A fizzing sound means that the solid is made of limestone.
- Show pictures of limestone statues that have been eroded by acid rain. Caves form easily and often in limestone because limestone dissolves so easily.

#### **Field Trip Activity**

- What animals can students find inside the cave?
   Are they animals that visit caves?
   Sometimes live in caves? Or cannot leave caves?
- Where is the spelunker?
- What do students see when they crawl through the tunnel?
- Can students find evidence of humans having used the cave?
- Can students identify the different speleothems?

#### **Post Activity**

Devil's Millhopper State Park

Sinkholes are formed when the ceiling of a cave collapses. Suggest that parents bring their students to visit Devil's Millhopper State Park to explore the sinkhole and the hammock that surrounds it. http://www.floridastateparks.org/devilsmillhopper/ Give students questions to think about when they visit the site.

- How do the plants and animals here compare to the life size replica seen at the museum?
- How would the water have affected the cave before it collapsed?
- · Why do students think the cave roof collapsed?







Devil's Millhopper State Park
photo credit: Gainesville/Alachua
County Visitors and Convention Bureau

Section Three: Pitcher Plant Bogs

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#### Introduction

**Seepage bogs** are habitats characterized by saturated, highly acidic, sandy soil with low nutrient availability. They are dominated by low growing plant species, such as grasses and carnivorous plants. Bogs form in areas where rainwater has been trapped near the surface by a layer of clay. Bogs often occur on slopes where water seeps from the surrounding elevated pinelands. Seepage creates the moist environment, favored by bog plants.

#### The process of bog formation is:

- 1. Rainwater soaks into the coarse sand near the surface.
- 2. As water seeps downhill, it is forced back to the surface by the underlying clay layer.
- 3. The water flows across the surface of the slope, contributing to the formation of a bog.

Streams often form at the bottom of these slopes. They join other streams, and eventually become rivers that flow to the Gulf of Mexico. Unique types of plants found in bogs are carnivorous plants.

The role of carnivory in plants is not completely understood. Carnivory may be an adaptation that allows these species to thrive in nutrient poor soils. Soil nutrient levels in bogs decline during periods of rapid plant growth or after several years without fire, perhaps making carnivory an important mechanism for survival during times of nutritional stress. Captured prey also may supply necessary micronutrients absent in the bog's acidic soil.

Carnivorous plants attract insects using shape and color, as well as the odor of secreted nectar. Some species, for example the yellow pitcher plant, use patterns created by ultraviolet light absorption along with red or purple pigmentation, while others produce odors that mimic pheromones of insects.

Some species of carnivorous plants grow side by side in bogs but attract different prey. Other plants are separated from one another because they prefer slightly wetter or drier conditions. These factors affect the type of prey captured, ensuring that each species catches the insects necessary for its survival

**Fun Fact:** The Venus Flytrap is native to a 100-mile radius around Wilmington, North Carolina. It was transported to North Florida by birds dropping the seeds in their feces during migration.



Section Three: Pitcher Plant Bogs continued

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#### **Guiding Questions and Answers**

- 1) How do plants attract, catch, and digest their prey? There are 4 types of ways carnivorous plants trap their prey:
  - a) Adhesive traps with fine hairs that are coated with a glue-like fluid. When an insect struggles, it becomes trapped in the sticky gel. The leaves on some species fold around the prey and secrete digestive enzymes. Insects eventually die in plants that do not have moving parts after becoming tangled and trapped in the sticky coating on the plant's leaves.
  - b) Closing traps, such as Venus flytraps, have leaves that snap shut when insects brush against hair-like triggers.
  - c) **Pitfall traps** in pitcher plants have downward-pointing hairs. This allows an insect to climb into the flower, but not out. The plant also produces waxy secretions inside their vase-shaped leaves to prevent insects from escaping. The insect eventually falls to the very bottom where it drowns in rainwater that accumulates in the leaf. Insects may be attracted to nectar which has a narcotic effect and aids in drowning.
  - d) **Trap doors** in aquatic bladderworts have underwater bladders that trap small invertebrates and an occasional small fish. Hairs trigger a trap door to open and water, carrying prey, rushes in.



**Downward-pointing hairs** 



Climb into the flower



Drowns in rainwater

Section Three: Pitcher Plant Bogs continued

#### 23

#### 2) Why is fire important to bogs?

Frequent fires caused by summer lightning storms have shaped many Florida habitats. Without fire, a bog is gradually invaded by woody shrubs and trees, and will turn into a shrub bog within 20 years. Fire slows the process and adds nutrients to the soil that is essential to bog life.

3) What is the difference between a bog, a marsh, and a swamp? All three are types of wetlands.

**Marshes** are dominated by grasses and other plants rooted in shallow water.

Bogs are specialized marshes that accumulate acidic peat, a deposit of dead plant material. Because of the high acidic content, bogs do not have high quantities of plants growing in them.

**Swamps** have a large water surface and are deeper than marshes. Plant life primarily consists of trees rather than grasses.



Summer fires







Marsh Bogs Swamps

## PART ONE: NORTHWEST FLORIDA: WATERWAYS and Wildlife Exhibition



Section Three: Pitcher Plant Bogs continued

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#### 4) What animals live in a bog?

Spiders, centipedes and other arthropods live on bog plants and the spongy bog soils. Insects feed on bog plants, including the pitcher plants, and pollinate their flowers. Several species of crayfish burrow in the muck, aerating the thick organic soils. Reptiles and amphibians such as coal skinks, eastern glass lizards, southern chorus frogs, and pinewoods frogs live in bogs. Numerous species of birds and mammals can be found there as well.

#### **Pre Activity**

Cave and Bog Formation: Caves form when there is a large amount of limestone that dissolves easily due to acid in water and soil. Bogs form when there is a large clay deposit in or above the limestone.

#### **Materials:**

- · Clear plastic cups
- Sponges, cut to fit tightly in the top of the cup
- Clay
- Water

- Explain that the sponge represents limestone. Northwest Florida is primarily limestone based.
- Place the sponge in the top of one cup. Pour water on top. What happens to the water? It percolates down through the limestone. This is how caves begin to form. The acidic value of the water dissolves the limestone creating caverns.
- · Next form a disc of clay to fit into the top of a second cup. Have the edges of the clay curl up the side of the cup so that it stays in place. This represents areas where the ground has a layer of clay in it such as the confining layer of clay in the Floridan Aquifer.
- · Pour a small amount of water on top. What happens to the water? It sits on the top of the clay and does not percolate down. Anywhere the soil has enough clay to form a barrier, water pools into lakes, or bogs.

#### **Field Trip Activity**

- · What animals can students find in the bog? There is a field guide in the exhibit to help you look.
- · Look at the large pitcher plant. What features can the students pick out that will help the plant attract and catch prey?

Section Four: Rivers 25

#### Introduction

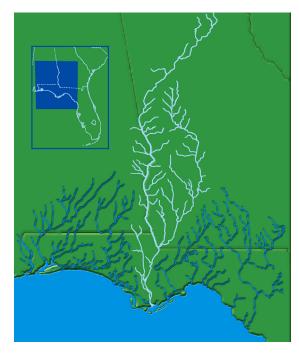
Florida's Panhandle is the most biologically rich area of the state. The freshwater mussel and turtle faunas in the region are good examples of this diversity. Over the last few million years, repeated sea level changes covered much of the Florida peninsula with saltwater, altering freshwater ecosystems and killing the organisms adapted to freshwater. Rivers and streams at higher elevations in Northwest Florida served as a refuge for freshwater species, allowing these species to survive. Often, areas of higher elevation became islands during warmer periods, isolating populations of animals. Diversification of animals occurred between these islands due to a limited breeding pool and different available resources. The Apalachicola River basin supports the highest number of reptile and amphibian species in Florida, the second highest in the United States. River forests are important nesting and migratory habitats for many birds. This diversity arises from an abundance of nesting and roosting cavities, plants, and water.

Florida has more than 1,700 streams and rivers. Twenty-one Florida rivers flow directly into the Gulf of Mexico; only two drain into the Atlantic Ocean. Six major rivers in Northwest Florida carry 19 million gallons of freshwater per minute to the Gulf of Mexico. These rivers support a rich diversity of species. Water flows from seeps, springs, and surface runoff through drainage basins. These basins interconnect uplands to ponds, lakes, swamps, streams, and rivers.

**Fun Fact:** Freshwater makes up only 3% of the world's water. Most freshwater is frozen in glaciers and polar ice caps, leaving less than 1% as a liquid.



Egret



Florida river flowing into Gulf of Mexico



Section Four: Rivers continued

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#### **Vocabulary Words**

**Fort Walton:** A term used to refer to an ancient culture that built mounds in the southeastern region of the United States

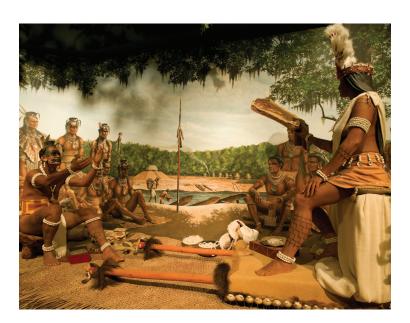
Mississippian: A term used to refer to an archaeological culture of the Southeast region of the United States

#### **Guiding Questions and Answers**

## 1) How have people in Northwest Florida utilized rivers?

The area we now call Northwest Florida was once a major political and cultural crossroads. People flourished along the numerous Panhandle rivers because they sustained important animal foods such as turtles, fish, and mussels. Riverine forests were full of deer, turkey, and squirrel, as well as wild plant foods such as hickory nuts, grapes, acorns, and persimmons. Fertile floodplain soils supported corn and other agriculture. In addition, the rivers served as highways for communication, travel, and trade.

Before European influence, the native people of Northwest Florida shared cultural traits with most societies east of the Mississippi River. Archaeologists refer to these societies as Mississippian. Powerful leaders ruled large, agricultural populations. Extensive trade networks located along rivers and over land, connected Mississippian societies. Archaeologists call the Mississippian societies in Northwest Florida, Southeast Alabama, and Southwest Georgia the Fort Walton culture. Florida's Fort Walton people lived between the Aucilla River and the Chipola River uplands. Fort Walton leaders expressed their power by building large earthen mounds and by displaying rare and valuable wares obtained





Cheifly exchange of exotic goods. Scene from Northwest Florida exhibit.



Section Four: Rivers continued

in ceremonial exchange with other Mississippian leaders. Items made of copper, marine shell, and greenstone served as symbols of high status throughout the Southeast.

As far back as 5,000 years ago, trade networks extended throughout eastern North America. Native people in what is now Florida imported copper from the Appalachian Piedmont and Great Lakes, galena from Missouri, mica from Georgia, steatite and mica from the Appalachians, greenstone from the Piedmont, and elaborate ornamental objects from other areas. In exchange, Florida native people exported marine shells, shell beads and ornaments, marine pearls, shark tooth ornaments and whelk shell dippers.

#### 2) How is the biodiversity of Florida's freshwater affected by pollution?

Many of the aquatic species living in Northwest Florida have restricted distributions and specific habitat requirements. This increases their vulnerability to extinction, and many river species are declining.

Plants and animals are in danger of extinction due to pollution from agriculture, industry and urban runoff, destruction of freshwater habitats by canalization, damming and development, sedimentation from deforestation, soil erosion, and competition with non-indigenous species.

#### **Pre Activity:**

**River Erosion:** Dirt eroded from rivers deposits further downstream or in the oceans. Pollutants that enter a river also are deposited downstream or in the oceans.

#### **Materials:**

- · Cardboard milk carton
- Fine-grained dirt
- Watering can with diffuser top (water sprinkles out instead of pours
- Containers of water
- · Empty glass jar
- Ruler
- Plastic tub
- Scissors or knife (teacher use only)
- Plastic sandwich bags
- Measuring cup
- · aper or student journal
- · Pencil or pen

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Section Four: Rivers continued 28

#### Set Up:

- Cut the back off of the milk carton.
- Measure equal amounts of dirt into sandwich bags. There should be two bags for each group.
- Fill containers with water.

#### Actions:

- Divide the class into groups of 2-3 students.
- Give each group: milk carton, two bags of dirt, ruler, plastic tub, empty jar, paper, pencil or pen, container of water, and watering can.
- Have students put one bag of dirt into the milk carton. The dirt should be spread out so that it covers the bottom.
- Drag a finger or pencil down the middle of the dirt to create a groove.
- One student should hold the milk carton so that the spout is over the plastic tub. For the first try, have them hold the carton at a slight slope
- · Another student should then measure a specified amount of water and put it in the watering can. Sprinkle the water on the top of the slope. Allow the excess water and dirt to drain into the tub.
- Pour the contents of the tub into the empty jar. Allow the dirt to settle to the bottom.
- With the ruler, measure how much dirt and how much water is in the jar. Record this amount on the paper.
- Rinse out the jar, tub and milk carton.
- · Empty the second bag of dirt into the milk carton, spread the dirt, make a groove, and measure water into the watering can.
- Hold the milk carton over the plastic tub at a steeper slope than the first time.
- Sprinkle the water over the top of the slope. Allow the excess water and dirt to drain into the tub.
- Pour the contents of the tub into the empty jar. Allow the dirt to settle to the bottom.
- With the ruler, measure how much dirt and water is in the jar. Record this amount on the paper.



Section Four: Rivers continued

•Discuss the results with students:

Which time did the river run faster? Would a river run faster in the mountains or near the coast? Why?

Which time did more dirt and water end up in the tub? Why?

What do students think happens to all the dirt that is eroded or carried away in steep rivers?

Does all of it get deposited further downstream? What happens to dirt that does not get deposited further downstream?

Since dirt and water that starts in the mountains runs all the way to the sea or ocean, what does this mean for pollution and garbage that is dumped into rivers in the mountains?

#### **Field Trip Activity**

- · Look at the trade scene.
- What do students see that gives a clue that these people lived near water?
- Who is the leader? What is unique about the leader? Why is the fact that the leader is a woman unique?
- Which group is from Florida? Which group is from up North? How can students tell?
- How did they travel here?
- What did they eat?
- Look in the water.
- What types of animals can students find?

#### **Post Activity**

Watershed: Water moves downhill to form rivers, lakes, streams or deposits into the ocean.

#### **Materials:**

- Paper (8 ½ x 11)
- Blue marker (water soluble)
- Black marker (water soluble)
- Spray bottle filled with water
- Cardboard or tag board (8 ½ x 11 or larger)
- Tape

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Section Four: Rivers continued

#### **Actions:**

- Have each student crumple a piece of paper into a loose wad. If it is crumpled too much, the watershed model will be too complicated.
- · Open the piece of paper, but do not flatten it out.
- Tape the piece of paper to the cardboard or tag board, so that the peaks and valleys are easily distinguished. Have each student write their name on their paper.
- Using the black marker, mark all of the tops of mountains and mountain ridges. Help students follow each ridge as far as it goes.
- Using the blue marker, mark all of the rivers, streams, or lakes seen. Explain that students will need to carefully look for all the folds and height changes in the paper. They should pretend that they are a drop of water and think about how they would fall and slowly move downhill. There will be places that the water cannot go down any further. This is likely a place to draw a lake.
- Mist the paper with water from the spray bottle. This is a representation of rain. Students should observe the water as it moves downhill as rivers and forms lakes. The colored ink will move to leave a trail where watershed is occurring.
- Allow the papers to dry.
- Discuss with students the methods they used to predict where watershed would occur.

Were they correct?

Did they miss some places?

Was there water that ran off the edge of the paper?

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Florida Museum of Natural Histor

Section Five: Coastal Ecosystems

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#### Introduction

Coastlines are biological edges. These specialized habitats form the transition between land-based ecosystems and the open sea. Plants and animals in these coastal habitats are exposed to rigorous, ever-changing environmental conditions caused by regular tidal flooding, mixing of fresh and salt water, hurricanes, and oceanic weather patterns.

Coastal environments, such as bays, lagoons, and sounds are links in a larger landscape of rivers, bayous, estuaries, and the sea. Although much of Florida's coastline has been developed, the Panhandle still has intact coastal environments and a vast array of plant and animal species. These contribute significantly to Florida's unusually rich biodiversity.

The Gulf of Mexico covers more than 600,000 square miles and has an average depth of 5,000 feet. Some areas are over 12,000 feet deep. The Loop Current enters the Gulf through the Yucatan Channel and exits through the Straits of Florida. Exiting water helps form the Gulf Stream, a current that brings warm water along the eastern coast of the United States. Surrounded by the United States, Mexico, and Cuba, the Gulf of Mexico is one of the largest enclosed bodies of salt water in the world with a watershed of more than two million square miles.



**Fun Fact:** The Apalachicola River discharges an average of 20,000 cubic feet of water per second.



Section Five: Coastal Ecosystems continued

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#### **Vocabulary Words**

**Barrier Island:** A long sandy island that runs parallel to a coastline and serves to protect the shore from erosion.

Bay: An inlet of the sea or other body of water, usually smaller than a gulf.

Bayou: A creek, secondary watercourse, or minor river that is a tributary to another river or body of water.

**Dune:** A mound of sand formed from wind and water.

**Ecotone:** A zone of transition between two different ecosystems.

**Estuary**: The seaward end of a river where tidal effects occur and freshwater comes into contact

with saltwater.

**Intertidal:** The area between high and low tide levels.

**Lagoon:** A shallow body of water near or connected to a larger water body.

**Pine:** An evergreen tree with needle-shaped leaves and woody cones.

**Sound:** A long passage of water connecting two larger bodies.

Oak: A tree that has acorns as fruit.

**Salinity:** The salt content of water.

**Tidal:** Fluctuations that occur in relation to the tides.



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Section Five: Coastal Ecosystems continued

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#### **Guiding Questions and Answers**

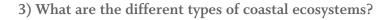
#### 1) How have humans impacted coastal ecosystems?

Upland forests are frequently developed because they are not subject to flooding. Development can reduce the flow of clean, fresh water to the coastal system.

Tidal marshes have also been impacted negatively by human development. Widespread pesticide use, in an attempt to control mosquitoes and other pest insects, has disturbed this fragile ecosystem.

## 2) How does plant life change as one moves toward the coast?

The ecotone (transition) between coastal forests and the open salt marsh is abrupt. Only salt-tolerant, shrubby plants, particularly yaupon holly (Ilex vomitoria) and southern red cedar (Juniperus silicicola), invade the margins of the marsh. Expanses of salt-tolerant grasses and winding creeks give marshes an open, distinctive look. Low wave energy allows the growth of non-woody, salt-tolerant plants. Life in coastal marshes is challenging, though, because changing tides constantly alter water and salinity levels. Few plant and animal species are adapted to this habitat.





Mother nature over development



Coastal plants

Lagoons are intertidal wetlands. They are protected from open marine waters by barrier islands. Lagoon species have adapted to high variations in salinity, wind and tidal currents, and low wave action. These plants and animals grow and utilize the abundant nutrients resulting in a highly productive ecosystem. This productivity is due to relatively shallow depths, the mixing of fresh and salt water, and organic materials flowing from rivers. Florida lagoon ecosystems provide a critical developmental habitat for most commercial and sport fisheries. Pollutants, development, and over-fishing threaten the future of Florida's lagoon species.

Barrier islands are long, narrow islands of sand that lie parallel to the coastline. Barrier islands are characterized by a beach on the seaward side, active and stabilized dunes in the interior, and a shore on the marsh side. Sculpted by waves and wind, they form an almost continuous fortification along Florida's Panhandle coast. They permit the formation of lagoons by providing protection from wave action and hurricanes. Desert-like plants and animals dominate these islands. They also provide migration stops and nesting habitats for many animal species. Unfortunately, because of their beauty, people often over-develop barrier islands.

Section Five: Coastal Ecosystems continued

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Barrier islands are dynamic. Sand deposition and removal continually reshapes barrier islands throughout the world. For example, Perdido Key has grown by nearly four miles in the last 100 years, while Cape San Blas looses approximately 100 feet each year. The vegetation growing on barrier islands is affected by wind-driven sand, salt spray, wave-and wind-driven erosion, and storm surges. Only hardy, drought-resistant plants live on dunes. The root systems of sea oats, other grasses, and shrubs stabilize the shifting beach sands.

Migrating birds and butterflies find food and a place to rest on barrier islands. These islands are used both in spring and fall. During fall migration, birds and butterflies congregate on barrier islands before crossing the Gulf of Mexico or moving into peninsular Florida. The flowers of fall-blooming plants and the fruits of the dune forests provide energy necessary for such long flights.

Ten species of shore and seabirds breed on barrier islands in Northwest Florida. Undisturbed beaches and dunes are important to the successful reproduction of these groundnesting birds. Islands usually harbor fewer terrestrial predators than the mainland. In addition to natural predators, adult birds, their eggs, and their young are also vulnerable to domestic animals and human activities.

Tidal marshes often are thought of as inhospitable places with little value. However, these very important habitats provide: entrapment of sediments and pollutants, protection against storms, a habitat for a rich variety of animals and plants, and a habitat for valuable seafood species. Coastal marshes are challenging environments since tides flood the marsh daily. As the tides rise and fall, animals and plants must tolerate immersion in saltwater or exposure to air, as well as changes in salinity and temperature. Plants and animals live where they are best adapted to survive. In tidal marshes, plants typically grow in distinct or nonoverlapping zones.



Barrier islands









Migrating birds



Tidal marsh

Section Five: Coastal Ecosystems continued

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#### **Pre Activity**

**Intertidal Zones:** Intertidal zones are home to a wide variety of organisms.

#### **Materials:**

- A variety of different sized and shaped shells, starfish, gastropods, limpets, etc.
- Pen or pencil
- Markers, crayons, or colored pencils
- Paper

#### **Actions:**

- Pair students up. Have them sit back to back. Give each student one shell, starfish, etc.
- Explain that all the organisms that they have are a few examples of the types of things that live in intertidal zones. They are going to pretend that they are scientists that just discovered a new species of animal.
- Each student should now take turns with their partner describing their object without telling their partner what it is. The partner should try and draw what is being described.
- After the entire class has finished, have the partners share their drawings while revealing the object.
- What characteristics did students use to describe their objects? Did their tactics work? Why or why not?

#### **Field Trip Activity**

- How might the plants seen in the tidal marsh help prevent erosion?
- How are eggs of birds and turtles camouflaged for the coast? What creatures do students think prey on eggs? What other dangers do the eggs face during development? What dangers do baby turtles face when they have hatched?
- What do students notice about the butterflies? Where are they going?
- Why do you think the osprey (sea hawk) is carrying the sticks? Has anyone seen an osprey before?
- Have students create a food chain from the animals they see in the tidal marsh diorama.



Section Five: Coastal Environments continued

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#### **Post Activity**

Sand: Looking at sand closely can reveal what it is made of and where it came from.

#### **Materials:**

- · Sand from as many locations as you can collect or buy
- Magnifying glasses
- Note cards
- · White glue
- Pencil or pen
- · Rock and mineral kits
- Magnets
- Glass jars with lids
- Water

#### Set up:

- Ask students and parents to collect sand from any locations they visit whether it is a lake, stream, river, creek, playground, beach, or their backyard.
- As samples come in, label the bags with their location.
- Divide sand samples into enough bags for 1 for each group. Label each bag with the location the sand was collected.

#### **Actions:**

- Discuss as a class what students think sand is made of. How do students think sand is made?
- Divide students into groups and give each group a set of sand samples.
- Work as a group to make observations about individual samples of sand by looking and feeling it while still in the bag.

How big are the sand grains?

Can you tell what they're made of?

What colors do you see?

What does the sand look like?

- Compare the different samples based on the observations they just made.
- Come together as a class and discuss the observations that different groups made. Record observations by sample location.

### Part One: Northwest Florida: Waterways and Wildlife Exhibition



Section Five: Coastal Environments continued

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- Distribute note cards to groups. Each student should make a note card for one sample by writing the name of the location on one half of the card and gluing a small amount of sand on the other half. Use a black or dark colored note card for lighter colored samples and a white note card for darker colored samples.
- Have students look at their note card with a magnifying glass.

Record the colors you see.

Draw a few grains of sand, but draw them much bigger than they are in real life.

What shapes are the grains of sand?

Do the grains have rounded edges or angular edges? Rounded grains have been worn smooth over hundreds or thousands of years. Angular grains have broken off of rock, coral, or shell more recently.

What size are the grains of sand? Are they all the same size?

• Gently rub a magnet on the outside of their bag of sand. Are any of the grains attracted to the magnet? If so, what color are the magnetic sand grains? If any grains are attracted, this is evidence that the sand contains some magnetic minerals, such as iron or magnetite. These magnetic minerals are usually black in color.

Distribute the rock and mineral kits. Have students compare their grains of sand to the kits. Does your sand have pieces of rock or minerals that match some in the kits?

- List the kinds of rocks and minerals that may be in their sand.
- Compare the different colors of sand in each group.

Which sand is the lightest in color?

Which is the darkest?

Arrange them in order from lightest to darkest.

What can one learn by looking at the color of sand? Colors give you clues about what your sand is made of. Dark sands are often volcanic in origin. Light sands can be made of animals like shells or corals, or of quartz or granite.



Section Five: Coastal Environments continued

• Compare the different size grains of sand in each group

Which sand has the smallest grains?

Which has the largest grains?

Arrange them in order from smallest to largest

Put a few pinches of the smallest grained sand in a jar with water. Put the lid on.

Do the same with the largest grained sand. Shake the two jars and put them down at the same time. Which sand settles to the bottom first?

Swirl the jars around. Which sand moves around?

What can one learn by looking at the size of grains in sand? If grains are very small, they were probably from an area with slow moving water such as a protected bay beach or a pool in a slowly moving stream. Tiny particles can stay put only where the water is moving slowly and gently. Large waves (or fast water) pick up small grains and carry them away down the river or off the beach and out to the ocean. If their sand grains are mainly large, they were probably from a wave tossed beach where the rough water carried all the smaller grains away. Only the larger grains remained because they were not picked up by the waves.

• Discuss as a class the observations made.

Are larger grains of sand typically a certain color?

Are small grains of sand typically a certain color?

Are larger grains of sand typically made of a certain rock or mineral?

Are small grains of sand typically made of a certain rock or mineral?

What are some of the ways sand comes to beaches?" Rocks, minerals and sediment are carried to the shore by rivers and creeks. Shells and bones of creatures that live on shore and at sea are brought to the shore by ocean currents. Sea cliffs and marine outcrops and terraces also erode.

If there is consistency among color, size, and composition, what can student guess about their sand?

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Florida Coastal Strategies http://www.floridacoastalstrategies.org/

Florida Department of Environmental Protection http://www.dep.state.fl.us/beaches/

Florida Museum of Natural History Education Resources http://www.flmnh.ufl.edu/resources

Florida Museum of Natural History Research and Collections http://flmnh.ufl.edu/museum/research\_collections.htm

Lubee Bat Conservancy http://www.lubee.org/

National Museum of the American Indian http://www.nmai.si.edu/

Northwest Florida Water Management District http://www.nwfwmd.state.fl.us/

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Section Four: Current Research at the Florida Museum

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Florida Museum of Natural History Research and Collections http://flmnh.ufl.edu/museum/research\_collections.htm

### **Archaeology**

http://www.flmnh.ufl.edu/sflarch/research.htm

Florida Museum of Natural History research in southwest Florida addresses issues of interest to scholars and a wide range of the American public. Research topics include:

- 1. The Calusa Domain
- 2. People and the Environment
- 3. Post-Contact Transformations

#### Herbarium

http://www.flmnh.ufl.edu/herbarium/melastomes/

Staff, research associates and graduate students of the University of Florida Herbarium (FLAS) have been collaborators in the Generic Flora of the Southeastern United States, a NSF-supported project, for many years. http://www.flmnh.ufl.edu/herbarium/genflor/

The Melastomataceae are the seventh largest family of flowering plants. They are liberally distributed throughout tropical and subtropical regions worldwide. Most species are instantly recognizable as melastomes by the acrodromous ("checkerboard") venation.

The Melastomataceae are particularly notable for their diversity of hair types and modifications of the stamens. In many areas, the family comprises a large percentage of the flora and is generally of considerable ecological importance. Despite being a very conspicuous component of most tropical ecosystems, their patterns of explosive evolution, intriguing biogeography and natural history, the Melastomataceae remain, to a large degree, an understudied family.



Section Four: Current Research at the Florida Museum continued

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#### **Mammalogy**

http://www.flmnh.ufl.edu/mammals/Welcome.html

The Florida Museum of Natural History receives all of the Florida Panthers that are found dead from various causes (e.g., hit by cars, male/male aggression, etc.). Therefore, the mammalogy department has an amazing resource of over 100 Florida Panther specimens that can be used to address various questions about diet and health. They examine the osteopathologies that these cats suffer from (likely the result of severe inbreeding) to track changes in severity and prevalence over the past 50 years. Mammalogy also uses stable isotope geochemistry to examine panther diet, which is highly variable.

FLMNH has an outstanding collection of the monotypic Florida Mouse thanks to the collecting efforts of Jim Layne and others. They will be looking at the population genetics of the historical populations sampled from within the collection, and their collaborator, James Austin, will be sampling current populations for comparison.

### **Ornithology**

http://www.flmnh.ufl.edu/birds/

The FLMNH Recent bird skeleton collection of 24,500 specimens, representing about 3,000 species, is approximately the fifth largest in the world in number of specimens and species. In 1992, the FLMNH received a bird skeleton collection. With the assistance of a National Science Foundation grant, this skeleton collection was computer-cataloged and integrated into the FLMNH bird collection. The skeleton collection has grown by 140% in the last five years. It contains specimens from 47 U.S. states and 103 countries.

The bird skin collection contains approximately 20,500 specimens representing at least 2,300 species. In 1992, the division received a collection of approximately 3,000 skins. The skin collection has grown by 23% in the last five years. It is 99% computerized and contains specimens from 45 U.S. states and 77 countries.

The egg collection, consisting of 10,400 sets representing 733 species, is 11th largest in North America in number of sets and 15th largest in number of species. It represents approximately 90% of the species and subspecies of North American birds. The egg collection has grown by 1% in the last five years. It is cataloged in a card file that includes original collectors' data slips or page references to the collector's field notes. Especially well represented are sets from New England and Florida.

The bird sound collection, in the FLMNH Bioacoustic Archives, with 20,500 cataloged recordings representing about 3,000 species, is perhaps third or fourth largest in the world in number of species. In the western hemisphere it is the second largest in number of species and third largest in number of recordings. Ornithology is now processing one of the largest accessions ever, the collection of Ben B. Coffey, Jr., with thousands of high-quality recordings from the southeastern USA and the Neotropics. The sound collection has grown by 20% in the last five years, not counting the Coffey accession.



Section Five: Current Events 45

Although Florida receives about 55-60 inches of rainfall a year, not all the water is available for use. Evaporation and transpiration results in a loss of 45 inches of rain annually. The dry season brings droughts that result in reduced amounts of stored water in aquifers. Aquifers are filled by rainwater soaking down through the soil. During a drought, reduced rainfall means less water reaching the underground aquifers, making them vulnerable to saltwater intrusion.

Water supply in Florida is also affected by droughts further north in the United States. As other states experience water shortages, they rely on a larger proportion of water in rivers, streams, and aquifers. The more water northern states utilize for consumption and agriculture, the less that is available to Florida residents.

In response to growing water usage needs by human populations, southern states have implemented water management regulations including restricted use for watering yards and gardens. For more information and additional classroom activities please see the following websites:

www.sfwmd.gov http://www.nwfwmd.state.fl.us/ http://www.epa.gov/safewater/kids/wsb/

### Part Three: Related Exhibitions and Programs



Section One: Permanent Exhibitions 46

### **South Florida People and Environments**

This exhibit celebrates the story of native people in South Florida and the environments that supported them. Walk along a boardwalk through a mangrove forest, travel underwater to view larger-than-life marine creatures, visit the house of a Calusa leader and much more.

### **Butterfly Rainforests: Where Science Takes Flight**

Stroll through this 6,400-square-foot screened, outdoor enclosure with subtropical and tropical plants and hundreds of living butterflies. View thousands of Lepidoptera species on the "Wall of Wings" and learn about butterfly and moth biology. See scientists working in the Butterfly Rearing Lab and the Research Labs.



Section Two: School and Outreach Programs

#### **Programs Overview**

School groups include home schools and public, private and faith-based PreK-12 schools within a school district.

The Florida Museum of Natural History offers the following field trip opportunities for school groups:

### **Guided School Programs**

Join our museum docents for hands-on classroom activities and interactive walks through our state-of-the-art exhibits and outdoor natural areas. Guided programs are offered Tuesday through Friday mornings, Oct. 7, 2008, through May 22, 2009. Programs fill quickly, especially for the months of October, November, April and May. To avoid disappointment, reserve your date as early in the school year as possible. Reservations must be made a minimum of three weeks in advance of the program date.

http://www.flmnh.ufl.edu/education/guided\_programs.htm

### **Indoor Programming**

- 10-60 students per program
- Each program is 60 minutes in length
- \$3 student, 1/10 ratio chaperone free, additional chaperones \$3/each
- Butterfly-focused programs will have additional entry fee into the Rainforest
- Programs will work with grades pre-school to 12th grade. Each program will be individualized to provide age-appropriate activities

#### **Indoor Program Options:**

- Butterfly and Moth Explorations
- Fossils No Bones About It!
- Trails in Time Florida's Indian Peoples
- · Waterways and Wildlife of Florida

#### **Outdoor Programming**

- 10-40 students per program
- Each program is 60 minutes in length
- \$3 student, 1/10 ratio chaperone free, additional chaperones \$3/each
- Outdoor Programs are available for pre-school through 5th grade students only

#### **Outdoor Program Options:**

- Eye on Insects Fall Only
- · Green Machine Spring Only
- · Stayin' Alive

## PART THREE: RELATED EXHIBITIONS AND PROGRAMS



Section Two: School and Outreach Programs continued

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#### **Self-Guided Visits**

Suitable for groups that prefer to visit the museum without the benefit of docents or staff. Reservations are required for all self-guided visits of 10 or more students to ensure a positive experience for your group. Self-guided visits must be reserved at least two weeks in advance and are available Monday through Friday during Museum hours. A staff member will greet your group and facilitate the purchase of any tickets before you enter the Museum. After that, your group leaders are entirely responsible for the educational experience of the students.

#### School Group Self-Guided Tickets (10 or more individuals)

See link - http://www.flmnh.ufl.edu/education/self\_guided.htm

#### **Outreach – Inquiry Boxes**

The Florida Museum of Natural History currently offers five Inquiry Box outreach programs for use in your class-room. They are also a great way to compliment your docent-led program or self-guided field trip to the Museum. Our Inquiry Boxes are correlated to the Sunshine State Standards and are designed to enhance FCAT preparation.

Each Inquiry Box contains selected natural history objects, games, a video, reference materials and a teacher's guide. Classroom teachers at any grade level may check out the Inquiry Boxes at a cost of \$25/box for a two-week period. Teachers will be responsible for the pick-up and return of the Inquiry Boxes to and from museum. If interested, please contact tours@flmnh.ufl.edu.

- Florida's Butterflies and Moths grades K-4
- Florida's Reptiles and Amphibians grades 2-6
- Northern Florida's Early Native People grades 4-8
- Southern Florida's Early Native People grades 4-8
- Florida's Seminole People grades 2-6

#### Coming Soon!

- Florida's Fossils grades 5-8
- The Geology of Florida grades 5-8

http://www.flmnh.ufl.edu/education/inquiry\_boxes.htm

# Part Three: Related Exhibitions and Programs



Section Three: General Visitor Programs and Special Events

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### **Programs for Children and Adults**

The Florida Museum offers a wide variety of educational programming for visitors of all ages. These programs include summer and spring break camps, adult workshops and classes, field trips, lectures, weekend and school holiday classes for kids, and a preschool program for tots and parents. Programming for the general public also includes annual and special events such as Collector's Day, Museum Nights, Butterfly Fest, Earth Day and Family Days at each exhibition opening.

#### **Discovery Room**

Swim through the shallows of a coral reef, puzzle together a prairie and create creatures from Florida's diverse ecosystems in our self-guided discovery stations. Visit our hands-on Discovery Room filled with activities and join us during scheduled program times for stories, puppets, Museum exploration with Dr. Discovery and more! To utilize the Discovery Room, groups must have one adult chaperone for every 5 students. The Discovery Room attendant reserves the right to limit the number of room participants or ask visitors to leave.

http://www.flmnh.ufl.edu/education/

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