



Biscayne National Park Biscayne Explorer: Wildlife Inventory and Nature Study Guide for Teachers

Introduction

This guide will assist teachers in co-leading activities by providing both program logistical information and background information on the ecosystems in Biscayne National Park. However, it is best to use this guide in conjunction with the Biscayne Explorer Teacher Workshop.

National Park System

The National Park System consists of nearly 400 national park units. These units vary from recreational areas to preserves and from military fields to monuments. All of these special places are considered national parks. They protect and preserve the cultural and natural resources of this nation.

Background Information About Biscayne National Park

Biscayne National Park is the largest marine park in the US, National Park System. Its close to 180,000 acres are comprised of the longest mangrove shoreline on the east coast of Florida, a major portion of Biscayne Bay and its seagrass meadows, the northern most islands of the Florida Keys and northern most portion of the Florida reef tract. Together with the park's 100,000 years of natural history are 10,000 years of human history.

Natural History of Biscayne National Park

Biscayne National Park was set aside to protect four unique ecosystems. Biscayne Explorer offers the students an opportunity to explore each of these. The following content will introduce you to each and help prepare you for your field trip.

The Biscayne Explorer Program

The Biscayne Explorer program is a land-based day program developed to introduce 4th-6th graders to Biscayne National Park's four interdependent ecosystems. The program has been designed to allow students to experience real world "hands-on" science process skills similar to those conducted by park scientists. In addition, we hope to provide students with a positive environmental education experience to take with them once they leave the park.

Although this year, the program has been updated to specifically correlate to the New Sunshine State Standards for Science, teachers can easily incorporate all areas of the curriculum in their pre-visit activities.

Teacher Workshop

In order to maximize the learning experience of students and assist teachers in preparing for their fieldtrip, it is highly recommended that teachers attend a one day on-site workshop prior to participating in Biscayne Explorer. The purpose of the workshop is multifaceted: to aid teachers in acquiring a personal understanding of the activities students will engage in through first-hand experience; share ideas on how to best prepare students prior to their onsite encounter; and become familiar with their responsibilities and the program logistics for students and chaperones.

Biscayne Education Program Goals

- To bring about a greater awareness of the National Park system in general and of Biscayne National Park as part of that system.
- To provide an outdoor learning experience that speaks to the needs of the students of South Florida.
- To promote critical thinking skills.
- To conduct a positive education program that is both resource and issue oriented.
- To cultivate values and behaviors which lead to the preservation and protection of Biscayne's resources.

Biscayne Explorer Program Goals

- To reinforce science standards met in the classroom.
- To introduce students to Biscayne National Park's natural resources.
- To model Biscayne National Park's resource management programs.
- To provide students with a stage for establishing a relationship with nature.

Program Objectives: Upon completing the program the students will be able to:

- Identify how organisms get the energy they need for survival.
- Explain the concept of interdependence and state at least two ways the health of one of the ecosystems depends on the health of another.
- Identify similar structures in different species of organisms.
- Name three adaptations organisms in Biscayne National Park have to assist them in survival.
- Describe how all animals depend on plants.
- Use observation skills to explore the natural world, record findings and communicate the results. Students can relate this essential skill to real research done in the park.
- Explain the value of keeping accurate records in research and can relate this to real research done in the park.
- Describe how material is recycled in the natural world and the role of decomposers in this process.
- Identify the four ecosystems of Biscayne National Park.
- State three real world habits students can adopt to help protect and preserve Biscayne National Park and other natural places.

General Logistics

Biscayne Explorer consists of 6 activity stations, plus a short introduction and conclusion. The stations are numbered, but can be started at any point. Each station should take about 20 minutes to complete. Groups should move to the next station when they hear the signal. Time has been allotted in the overall schedule for moving from one station to the other. Generally, 3 stations will be completed before lunch and 3 stations will be completed after lunch. In total, groups should be prepared to spend 4 hours at Biscayne National Park, from the point their bus pulls up to the time the bus pulls away.

Program Schedule

- 9:30 Bus pulls up to Dante Fascell Visitor Center
(Ranger will board the bus to say a few words)
Students unload
- 9:40 Bathroom break
(During this time the ranger will coordinate any last minute logistics with teacher.)
- 9:50 Introduction and instructions on lawn (Ranger Led)
Students divide into groups if necessary
(10-15 students per group is preferred, but larger groups may be accommodated)
- 10:00 Students, teachers, chaperones and ranger(s) will begin to work through the six stations
(change station every 20 minutes at the signal)
- 11:15 Lunch
- 11:45 Stations continued
- 1:00 Closing (Ranger Led)
- 1:15 Load the bus
- 1:30 Departure

Teacher Responsibilities

The program is designed to be a partnership between the teacher and the ranger. The lead teacher and the ranger work together both before and during the visit. The lead teacher is responsible for preparing him or herself as well as other adults for leading a small group of students through the six activity stations. In order to ensure that all educators, as well as the students, understand all the concepts, educators will rotate with the students instead of teaching just one station as the students rotate. All necessary information is sent to the teacher prior to the field trip.

Chaperones

One adult for every ten students is required for the field trip. The chaperones are an integral part of the experience. Their attitudes are contagious. Students will look to them for guidance and echo their attitudes toward the program, the resources and the ranger. Help chaperones understand that they will be expected to be active participants in all aspects of the program. In some cases, chaperones may be asked to lead small groups of students through the activity stations. In that case, they should be prepared to play the role of an educator and to facilitate the activities. Chaperones are expected to comply with the same rules as the students.

Scheduling your field trip

Registration for Biscayne Explorer can easily be done online. Just click on “Required Forms Link” in the “For Teachers” section in our website www.nps.gov/bisc. You ask questions by calling (305)230-1144 x 08 or by e-mailing: Biscayne_Education@nps.gov. You do not have to be workshop qualified to secure a date but it is recommended that you attend the workshop prior to your class visit. Once your reservation is confirmed you will receive information from the ranger who will conduct the program. One week prior to your visit your ranger will call you to tie up any loose ends.

Science Benchmark Correlations: all of the activities that students will participate in can be correlated with the new Generation Florida Sunshine State Standards - Big Ideas for Science. In addition, within this teacher guide, you will find six (6) sections each one corresponding to one of the activity modules your students will complete while visiting the park. Here you will find an assortment of pre and post visit activities to enjoy with your students. Adapt them to your specific grade level or particular student needs. Activities vary in length, by grade level, complexity, and appeal to all learners.

Student Preparation

To enrich your field trip experience, prepare students and chaperones before your visit. Research has shown that the field trip experience is enhanced if the participants are well prepared prior to the field trip. Here are some suggestions:

- Enrich your students' experience and make the trip a part of a unit of study and incorporate areas of Reading, Language Arts, Science, Math, Social Studies as well as Fine Arts.
- If you have Internet access in your classroom, visit the park web-site at www.nps.gov/bisc. Your students can prepare by participating in an e-field trip.
- Involve your group/class in planning the field trip and in what to wear and bring.
- Study the area you will visit; look at pictures and familiarize yourselves with the Park and Biscayne Bay.
- While in the Park, look for opportunities to help your students make connections with what they learned in the classroom.
- Make sure your group understands the program logistics and what to expect.
- Maintain close communication with your ranger.
- Use the Electronic Field Trip provided on our website www.nps.gov/bisc. This interactive web based tool is offers a great exploration of the ecosystems and relationships that we explore in the park.

It's all in the details...

It is the responsibility of the teacher to divide the class into groups and assign partners **prior** to arrival at the Park. This saves time and confusion upon arrival. Groups should consist of no more than 15 students and at least one teacher or chaperone. Partners and name tags are also highly recommended.

Ranger Introduction and Conclusion

The park ranger coordinating your Biscayne Explorer program will conduct an introduction and conclusion to the field trip. These components are very important to the success of the program. The introduction will set the stage for the program. It will get the students, chaperones, teachers and rangers on the same page. In the conclusion the ranger will connect the concepts learned and informally evaluate the students' comprehension of the material.

Dressing for the Outdoors

Biscayne Explorer is conducted in an outdoor setting. Bugs, rain, wind and heat are a natural part of the South Florida environment. All participants should dress appropriately for the weather conditions on the particular day of their visit. It is recommended that participants wear light weight clothing and add additional layers as necessary due to rain, wind or cold. Pants and long sleeves will also protect students from the sun and bugs. Sunscreen and mosquito repellent is allowed. Mosquito repellent can be sprayed on clothes instead of directly on skin since it contains harsh chemicals. Hats and sunglasses can also be worn for added protection from the elements.

Rules

- Closed shoes are required of all participants
- Cell phones and other gadgets need to be turned off
- A minimum of 1 adult for every 10 students
- Adults are responsible for student behavior
- Lead Teacher is responsible for chaperone behavior

Fees

Biscayne National Park's education programs are free of charge. There are no entrance fees to the park.

Transportation

At this time each school must arrange and pay for its own transportation to the park. It is highly recommended to transport the students in a bus.

Parking

Bus and vehicle parking is available at the Dante Fascell Visitor Center.

Lunch

Beverages and snacks are available at Convoy Point. However, in the interest of time, it is recommended that each student has a bag lunch. Food should not require any preparation and lunch itself should not take more than 30 minutes, unless different arrangements have been made ahead of time. A cool dry place will be provided for food storage. Picnic tables are available for lunch.

Explorer Stations Summary & Pre-Visit Suggested Activities

STATION: Bird and Fish Count (wildlife inventory, identification)

Location: Boardwalk

Activity Summary:

Students will take an inventory of the bird and fish life while walking on the boardwalk along the bay as a measure of the health of the area. They will use bird and fish identification cards to identify the wildlife.

Onsite Objectives: (Students will)

- Learn the proper use of an identification key while making field observations.
- Understand that to compare and contrast observations and results is an essential skill in science.
- Recognize that a successful method to explore the natural world is to observe, record, and then analyze and communicate results.
- Discern that all living things are different but share similar structures and needs.

Science State Correlations:

Big Idea #1 The Practice of Science

Big Idea #2 The Characteristics of Scientific Knowledge

Big Idea #14 Organization and Development of Living Organisms

Big Idea #15 Diversity and Evolution of Living Organisms

Big Idea #17 Interdependence



Birds and Fish of Biscayne (Information Background)

Over 200 species of birds can be found year-round or migrating through Biscayne National Park every year. The most commonly seen are the pelicans, cormorants, gulls, and royal terns. Many of the birds that spend summer months in the continental U.S. and Canada winter in Central or South America. The islands provide a place for these birds to rest, feed, and find fresh water.

There are over 500 species of fish that can be found in the waters of Biscayne National Park. They range in size from less than an inch to over 10 feet in length. The fish fauna are predominately temperate and continental in the winter and tropical to subtropical in the summer. Some of the species may be euryhaline (able to withstand a wide range of salinities).

The body structure of fish can vary greatly depending on the habitat and behaviors of the fish. Among the most common fish that will be seen along the shoreline and boardwalk of the park are: killifish, trunkfish, gray snapper, and pipefish.

Suggested Activities for Pre - Visit:

A. Introduce Vocabulary (Reading/Language Arts connection)

It would be helpful if students possessed a working knowledge of these terms in order to facilitate learning connections during their visit to the park.

1. **inventory**: to make a detailed list that reflects an amount
2. **data**: information or facts that have been collected
3. **observations**: an act of gathering information (as for scientific studies) by noting facts or occurrences.
4. **juvenile**: not yet mature, still young or developing
5. **camouflage**: the hiding or disguising of something by covering it up or changing the way it looks
6. **biodiversity**: variety in an environment as indicated by numbers of different species of plants and animals
7. **species**: a class of things of the same kind and with the same name; a unique plant or animal that is able to reproduce itself and to evolve.
8. **organism**: an individual living thing that carries on the activities of life by means of organs which have separate functions but are dependent on each other
9. **ecosystem**: a biological community (all living things) interacting with their physical environment (water, air, minerals, etc.) especially under natural conditions
10. **decomposers**: an organism that feeds on and breaks down dead plant or animal matter
11. **consumers**: in a food chain, an animal that depends on plants and/or other animals for its energy
12. **producers**: an organism, as a plant, that is able to produce its own food from inorganic substances (sun, CO₂, water).

B. Introduce the Park via an electronic field trip experience (follow the link provided below):

Tour the mangrove shoreline, the shallow bay and the northern portion of the third largest coral reef tract in the world. This program focuses on Biscayne National Park's four ecosystems and how they are integral to each other and to people. (Although this electronic field trip is geared for 7th and 8th grades but can be enjoyed by all).

<http://www.nps.gov/bisc/forteachers/underwater-ecosystem-adventure-electronic-fieldtrip.htm>

C. **Comparing & Contrasting Living Things** (Reading in the content area connection)

After exposing students to books related to birds and fish (see suggested titles), have students create a Venn Diagram or T-Chart to answer the following probing questions:

- What is a non-living thing? What is a living thing?
- What are some important characteristics of Fish and Birds?
- How are the two different? How are they similar?
- What is the relationship between some of the birds and fish at Biscayne?

D. **Biscayne National Park Alphabet Book**: (Reading/L. Arts, Science, and Fine Arts connection)

As a class, students can create their own A to Z book (alphabet book) about the different animals, birds, fish, vertebrates, invertebrates, and plants that can be found in Biscayne National Park. Once completed, the teacher can help students publish their work by binding the pages into a class reference book for the classroom or media center.

E. **“She’s Wearing a Dead Bird On Her Head”**: (Reading/L. Arts and Social Studies connection)

Use the popular children’s book to launch a study into the history of the bird plume industry. Teachers can read the story to the class and then discuss how making a “fashion statement” impacted the many bird species found in and around Biscayne and Everglades National Parks. Have students brainstorm ways in which humans still impact the lives of many species and habitats today. Make a list to display in the classroom and continue to add as ideas come up.

F. **Research Report** (Reading/Language Arts and Technology connection)

Students can be given an independent or group research project on a species of bird or fish found within the park. This would require them to use electronic resources such as a word processor or presentation program, as well as the Internet to gather information. The Park’s electronic field trip found at [www. http://www.nps.gov/bisc/forteachers/underwater-ecosystem-adventure-electronic-fieldtrip.htm](http://www.nps.gov/bisc/forteachers/underwater-ecosystem-adventure-electronic-fieldtrip.htm) may prove useful. The projects can be completed in traditional pencil/paper format, typed, or students may create a PowerPoint presentation to be delivered to the class.

G. **Data Gathering & Graphing** (Mathematics and Science Connection)

Have students practice their data gathering skills by allowing them to observe and record different bird, reptile, or insect species found in and around the school yard. Afterwards, have them create a class graph and report their findings. Emphasize proper labeling of titles and x and y axis.

H. **Critical Thinking Questions for Whole Class Discussion**

- What is species richness? (Level of species variety)
- Why would a bay full of nothing but dolphins be unfavorable for Biscayne? (Biodiversity)
- Why do animals need something to eat them? (Population control)

I. **Literature Connections** (suggested trade book titles):

- *Henry The Impatient Heron* by Donna Love
- *She's Wearing a Dead Bird On Her Head* by Kathryn Lasky
- *If A Dolphin Were A Fish* by Loran Wlodarski
- *Awesome Ocean Science* by Cindy Littlefield
- *Ocean Life From A to Z* Book and DVD [Hardcover] by Cinthia Stierle and Annie Crawley
- *Florida's Fabulous Waterbirds* by Winston Williams
- *Florida's Fabulous Birds* by Winston Williams
- *Florida's Fabulous Fishes* by Gary Cochran and Doug Perrine
- *Fish* (DK Eyewitness Books) by Steve Parker

J. **Web Based Resources:**

- Animals of Biscayne National Park- <http://www.nps.gov/bisc/naturescience/animals.htm>

Biscayne National Park Underwater Ecosystem Electronic Field Trip Adventure
<http://www.nps.gov/bisc/forteachers/underwater-ecosystem-adventure-electronic-fieldtrip.htm>
- Discovery Learning for Secondary Teachers (<http://www.discoveryeducation.com>)
- Miami-Dade County Public Schools Media Services:
http://library.dadeschools.net/online_db.htm

STATION: The Seagrass Connection (food webs, energy flow)

Location: Beginning of blue boardwalk bridge

Activity Summary:

Students will examine animal specimens collected for seagrass research in the park. After examining the specimens, they will work together to form a food web to illustrate the importance of this nursery ground.

Objectives: (Students will)

- Identify ways that plants, animals, and protists interact and depend on one another.
- Know that animals eat plants or other animals to acquire the energy they need for survival
- Understand the causes (why) and effects (what) of the relationships within a typical food web

Science State Correlations:

Big Idea #1 The Practice of Science
Big Idea #2 The Characteristics of Scientific Knowledge
Big Idea #6 Earth Structures

Big Idea #14 Organization and Development of Living Organisms
Big Idea #15 Diversity and Evolution of Living Organisms
Big Idea #17 Interdependence

Seagrass Meadows at Biscayne (Background Information)

Two unique habitats dominate the bay, the seagrass meadows and the hard bottom. The most productive community in the bay is the seagrass meadow. Seagrasses are marine flowering plants with true roots, leaves and stems. They produce tiny flowers, spiny seeds and energy through photosynthesis.



The dominant seagrass found in the bay is turtle grass. The blade is wide and ribbon-like, $\frac{1}{4}$ to $\frac{1}{2}$ inch wide. Manatee grass a cylindrical, thin-bladed grass about $\frac{1}{8}$ inch wide also grows here as does shoal grass, a narrow, ribbon-like blade, $\frac{1}{10}$ to $\frac{1}{8}$ inch wide. These seagrasses form dense mats on the sea floor. Their extensive root systems help stabilize the sediments. This action keeps the water clear, enhancing photosynthesis. Seagrass meadows support one of the richest assemblages of individual species of any known marine community. The productivity of this community is extremely high, and it is the known nursery ground for the early stages of the commercial shrimp, the spiny lobster, and many species of fish. Manatees, sea turtles, sea urchins and certain parrot fish all graze in the seagrass beds of Biscayne Bay.

Rockier or hard bottom surfaces occur where faster water currents prevail. Sponges find a home in this bay bottom habitat. As filter feeders they constantly pump a steady flow of water through their bodies clarifying the water as they expel it.

Suggested Activities for Pre-Visit:

A. Introduce Vocabulary (Reading/Language Arts connection)

It would be helpful if students possessed a working knowledge of these terms in order to facilitate learning connections during their visit to the park.

1. **Food chain:** a series of organisms in which each uses the next usually lower member of the series as a food source
2. **Food web:** the many connected food chains by which organisms of a community obtain their energy.
3. **Nursery:** an area where the young of a species live for the early part of their lives
4. **Seagrass:** a type of grass that grows in sandy bottoms along coastal waters with true roots, leaves, stems, and produce energy through photosynthesis. Seagrasses stabilize sediments and are habitat for other marine species.
5. **Energy flow:** the flow of energy between one living thing and another (producers-consumers)
6. **Fragile:** easily broken or destroyed
7. **Native:** a species belonging originally or naturally to an area
8. **Non-native:** a species not belonging originally to a certain area
9. **Bacteria:** a single celled organism
10. **Algae:** a type of plant commonly found in fresh or salt water habitats (does not have typical roots, stems, and leaves)
11. **Fungi:** a group of organisms that do not go through the process of photosynthesis and aid in breaking down trees, and other organic material
12. **Protists:** Living organisms belonging to the family of bacteria, algae, and fungi

B. Identifying Cause & Effect Relationships (Reading/L. Arts connection)

Help students identify some of the relationships and connections among the creatures living in the Seagrass environment by creating a Cause/Effect chart.

C. Photosynthesis: (Science connection)

Introduce or review the process of photosynthesis in plants so students can better understand where the flow of energy between living things originates (sun).

D. Animal Diversity Found In Our Oceans - Food Webs (Science/Fine Arts connection)

Using various photographs or student created illustrations of animals commonly found in South Florida coastal waters, students will work to create a living representation of an actual food web. Students may hold or wear a particular animal and find their connections among other animals and creatures that depend on the web. Yarn or string may be used to further demonstrate the “connections”.

E. Reader’s Theater - “Life In the Seagrass” (Reading/L. Arts/Fine Arts connection)

Teachers might design a Reader’s Theater play where students all have rolls as members of a Seagrass community. They can act out and discuss the problems they face for survival and show concern for all members of their community. Some animal roles may include: hermit crabs, land crabs, lobster, snapper, barracudas, flounder, jelly fish, sea horses, cowfish, bonefish, green sea turtles, and manatees. Don’t forget the part of the Seagrass too.

For opportunities to perform the skit for the public at the park please speak to a representative in our Education Department to make arrangements.

F. Critical Thinking Questions for Whole Class Discussion

- What do all animals need to survive? (Food, water, shelter, space)
- What does a habitat provide? (Food, water, shelter, space)
- How would a change in fish populations directly affect our lives and the lives of creatures that depend on them? (Commercial fishing, tourism, breakdown of the food web)
- What is species richness? (refers to the level of species variety)

G. Literature Connections (suggested trade book titles):

- *Sam the Sea Cow* by Francine Jacobs
- *Into the Sea* by Brenda Z. Guiberson
- *Sea Turtles* by Lorraine A. Jay

- *Seagrass Beds* by Kimberly Jane Pryor
- *Water Habitats* by Molly Aloian
- *Wetlands Explorer* by Mary Quigley
- *Exploring Freshwater Habitats* by Diane Snowball
- *Exploring Saltwater Habitats* by Sue Smith
- Readers' Theater: Featuring Science and Social Studies Topics, Available for Grade 4-6th (Readers Theater: Science and Social Studies by Steck-Vaughn Company)

H. Extensions:

- **Sea Turtle Journey** - Schedule a classroom visit with one of our Rangers. A story and game led by a Ranger that conveys the extraordinary life of sea turtles in Biscayne National Park. (appropriate for K-5)
- Research the value of the Seagrass environment to commercial and tourist industry in Florida.
- Design posters creating awareness for taking care of our fragile coastal habitats - teachers may coordinate with our Education Department to have an exhibition at the park.
- Sign up with the Adopt-A-Manatee Program. Classes or groups may adopt a Florida Manatee in order to help raise awareness and funding for scientific study (<http://www.savethemanatee.org/default.html>)
- Turtle Hatchling Release Program: students may sign up to go on a Sea Turtle egg laying or hatching event during the appropriate season (http://www.miamidade.gov/ecoadventures/seaturtle_program.asp)

I. Web Based Resources:

- Defenders of Wildlife: http://www.defenders.org/wildlife_and_habitat/wildlife/manatee.php
- Discovery Learning for Secondary Teachers (<http://www.discoveryeducation.com>)
- Miami-Dade County Public Schools Media Services: http://library.dadeschools.net/online_db.htm

STATION - Living on the Edge (mangroves, adaptation)

Location: Western most point of jetty, off the boardwalk

Activity Summary:

Students will step off the boardwalk onto a designated area with examples of the three mangrove species that occur in South Florida. Students will read the labels on the trees describing each of their characteristics and use magnifying lenses to get a close look at the mangroves' adaptations.

Objectives: (Students will)

- Recognize that living things compete in a climatic region with other living things and structural adaptations make them fit for an environment.
- Comprehend that organisms are growing, dying and decaying and that new organisms are being produced from the materials of dead organisms.
- Know that organisms decompose dead plants and animals into simple minerals and nutrients for use by living things and thereby recycle matter.

Science State Correlations:

Big Idea #1 The Practice of Science
Big Idea #2 The Characteristics of Scientific Knowledge
Big Idea #6 Earth Structures

Big Idea #14 Organization and Development of Living Organisms
Big Idea #15 Diversity and Evolution of Living Organisms
Big Idea #17 Interdependence



The Mangrove Shoreline at Biscayne (Background Information)

Fresh water flowing into the park first passes through the mangrove shoreline. The mangrove shoreline on the western edge of the park represents the longest stretch of undeveloped mangroves remaining on the east coast of Florida. The mangrove community contains four similar but unrelated trees. They are all grouped together as mangroves due to their similar habitats and special adaptations for life in the low oxygen seaside environment.

Red mangroves typically grow closest to the shoreline. Fallen mangrove leaves form the basis of an extensive food chain and nourish many species of algae and invertebrates. The mangrove shoreline offers protection to juvenile and small fishes and invertebrates. The mangrove roots trap soil and detritus protecting and stabilizing delicate shoreline against wave and storm action thus helping to keep the water clear. Black mangroves can be found near shore growing in wet or swampy soil. These trees, with their twisted limbs, are surrounded by pencil-like projections emerging from the ground. These “breathing roots” are called pneumatophores. They promote gas exchange through the lower surface of the leaf. Because of the saltiness of the leaf early settlers used them as a seasoning in cooking. It is also believed that the bark may have medicinal value in controlling growth in tumors.

The white mangrove is usually found on higher ground as are the buttonwood trees, often referred to as the fourth mangrove.

To the east of the bay lie thirty two ancient coral reef islands found in the Biscayne National Park. Here, much like on the mainland, the mangroves serve as a buffer zone between the salt water and the freshwater allowing creatures and plants to intermix with plants and animals of the interior. Mangrove trees perform another important function. Mangroves are our first line of defense. They also help keep our coasts from being damaged too badly from powerful storms like hurricanes by absorbing the brunt of tidal surges within their roots. Hurricane Andrew devastated most of Biscayne National Park’s mangrove islands stripping them bare of leaves. It took nearly three years for them to come back from the damage inflicted upon them by the massive storm.

Suggested Activities for Pre-Site Visit:

A. Introduce Vocabulary (Reading/Language Arts connection)

It would be helpful if students possessed a working knowledge of these terms in order to facilitate learning connections during their visit to the park.

1. **adaptation:** is the ability of an organism to change its behavior or physical characteristics in order to respond to changes in its habitat or environment.
2. **species:** a group of individuals having some common characteristics that makes them distinct from other individuals (ex: roses/flower)
3. **habitats:** place that is natural for the life and growth of an organism (ex: fish/ocean, camels/desert, alligators/fresh water).
4. **characteristics:** a property, trait, or quality of an organism or thing that makes it distinctive.
5. **environment:** the air, water, minerals, organisms, and all other external factors surrounding and affecting a given organism at any time.
6. **ecosystems:** the interaction of a community of organisms with the living and non-living elements of their environment (fish/coral reef/ocean).
7. **decomposers:** an organism that feeds on and breaks down dead plant or animal matter
8. **consumers:** a plant or animal that eats other plants or animals for food

9. **producers**: an organism, as a plant, that is able to produce its own food from inorganic substances (sun, CO₂, water).
10. **fertilizer**: broken down organic material that releases valuable nutrients that work to improve soil or other material making it suitable for the growth of organisms.
11. **nutrients**: A food substance that provides energy or is necessary for growth and repair. (ex: are vitamins, minerals, carbohydrates, fats, and proteins)
12. **decay**: the breaking down of a material from its original state of being (boulders/pebbles or fallen leaves/soil)
13. **detritus**: is a combination of broken down organic material from plants, animals, and animal waste. It is rich in nutrients and make good soil.
14. **recycled**: to pass through a cycle again; repeat a process from the beginning.
15. **propagule**: a plant part, such as a bud, that becomes detached from the rest of the plant and grows into a new plant
16. **seedling**: a very young plant produced from a seed

B. Read-A-Loud: (Reading/Language Arts connection)

Using the popular trade book “The Sea, The Storm, and The Mangrove Tangle”, the teacher may introduce students to the world of Mangroves by reading this selection to the class, sharing the illustrations in the book, and discuss what is happening. The book contains rich examples of vivid language (verbs), descriptive words, and wonderful use of dialogue that can be useful in Language Arts lessons.

C. Writer’s Workshop (Language Arts connection)

In the story “The Sea, The Storm, and The Mangrove Tangle”, all of the creatures that depend on the mangrove tangles shared their ideas and feelings about life in this amazing habitat. Have students practice their personification skills, while writing a story from the point of view of the Mangrove Trees. How do the trees feel about having all these creatures living within its roots? Suggest that they give the mangroves a voice to speak to all those who visit. Are the mangroves brave in the face of the coming storm? Have students share their writing pieces with the class.

D. Comparing & Contrasting Characteristics of Mangrove Trees (Reading/L. Arts/Science connection)

The teacher can provide appropriate information, or may have students conduct research on Mangrove Trees. Focus should be on types (red, black, and white), typical growing conditions, and adaptations. Perhaps a 3-circled Venn diagram might be useful or a 3-tabbed foldable.

E. Mangrove Diorama: (Reading/L. Arts/Fine Arts connection)

After exposing students to several visual examples of mangroves, assign them to create a shoebox diorama depicting life in a mangrove tangle. It would be helpful for them to collect and/or research information about the different creatures that inhabit the mangrove tangles and use various media to reproduce the look of this important environment.

F. Powerful Storms in Florida: (Science and Florida Social Studies connection)

Help students research the effects hurricanes have had on our South Florida coastal habitats. Create a timeline depicting those events. Have students learn about hurricane tracking, categories, and preparedness.

G. Mangroves Around The World: (L. Arts/Social Studies connection)

Mangroves are a protected plant species here in Florida. Students can also look into the importance of mangrove presence to the human communities in other countries that live in and around their habitat. For example: economic benefits that come from abundant fishing opportunities, environmental benefits from a protected coastline, a natural resource used for paper and salt). Allow students to practice their mapping skills by first identifying countries where mangroves still exist along coastlines and marking it on a world map.

H. Critical Thinking Questions for Whole Class Discussion

- What role do mangroves serve? (Prevent erosion, provide shelter, provide detritus)
- What impact would the removal of mangrove trees from our coasts have on the ecosystems that exist there? (loss of coastline protection, nurseries, habitat for countless creatures etc.)
- What can we do to help protect the mangroves along our coasts? (open ended)
- Biscayne NP has the longest stretch of undeveloped mangrove shoreline. What is undeveloped?

I. Literature Connections (suggested trade book titles):

- The Sea, The Storm, and The Mangrove Tangle by Lynne Cherry
- Mangroves, Trees In The Sea by Jerry, Kidaz, and Michael Greenberg
- Mangrove Wilderness: Nature's Nursery by Bianca Lavies
- Mangrove Seed Chronicles: Learning To Trust by Dan Kapica
- The Wondrous World of the Mangrove Swamps of the Everglades and Florida Keys by Katherine Orr
- The Mangrove Tree: Planting Trees to Feed Families by Susan L. Roth

K. Web Based Resources:

- Biscayne National Park - Mangroves <http://www.nps.gov/bisc/naturescience/mangroves.htm>
- Florida Keys National Marine Sanctuary
http://floridakeys.noaa.gov/sanctuary_resources/moremangrove.html
- Florida's Mangroves <http://www.tbep.org/pdfs/FloridasMangroves.pdf>
- Miami-Dade County Public Schools Media Services:
http://library.dadeschools.net/online_db.htm
- Discovery Learning - For secondary teachers <http://www.discoveryeducation.com>

STATION - Coral Core (coral reefs, adaptation)

Location: East Lawn

Activity Summary:

Students will learn about what makes up coral through examining coral samples and material read by the educator. Students will reinforce what they learn by sketching a diagram of a coral polyp.

Objectives: (*Students will*)

- Describe how plants use carbon dioxide, water and sunlight energy to turn minerals and nutrients into food for growth, maintenance, and reproduction.
- Explain how variations in light, water, temperature and soil content are largely responsible for the existence of different kinds of organisms and population densities in an ecosystem.

Science State Correlations:

Big Idea #1 The Practice of Science
Big Idea #2 The Characteristics of Scientific Knowledge
Big Idea #6 Earth Structures

Big Idea #14 Organization and Development of Living Organisms
Big Idea #15 Diversity and Evolution of Living Organisms
Big Idea #17 Interdependence

Coral Reefs at Biscayne (Background Information)

East of the islands is the living coral reef. The reef found within Biscayne National Park is the northern most portion of the Florida Reef tract. Coral reefs cover less than 0.2% of all of the ocean floor but 25% of all marine life can be found there. Reefs have been described as the rainforests of the sea.

Corals require specific conditions in order to survive. The temperature of the water must be between 68-86 degrees Fahrenheit. Water clarity is essential for the algae living in symbiosis with the coral. In order to photosynthesize, sunlight must be able to reach the coral. There must also be a food source for the coral. Although not located near the reef, the mangrove shoreline and bay to the west of the reef are important to the health of the reef. Many of the creatures that spend their adult lives on the reef use the mangroves and bay as a nursery. Mangroves catch much of the run off from the land, keeping the water clear. In addition, water is filtered by sponges in the bay and on the reef. Each ecosystem is interdependent as water flows through the park.



Suggested Activities for Pre-Site Visit:

A. Introduce Vocabulary (Reading/Language Arts connection)

It would be helpful if students possessed a working knowledge of these terms in order to facilitate learning connections during their visit to the park.

1. calcium carbonate: a natural solid substance found in nature as limestone and marble coming from plant ashes, animal bones, and shells.
2. coral polyps: are small marine invertebrate animals that build their own skeletons (using calcium carbonate)
3. algae: any plant or plantlike organism that includes forms mostly growing in water. Algae lack true stems, leaves, or roots. Zooxanthellae is the scientific name for the algae that lives inside the coral polyps.
4. coral reef: are underwater structures made from the calcium carbonate secreted by colonies of polyps coming together to form a reef
5. colony: a group of individuals or things with common characteristics living in close proximity with each other.

B. “Ocean Commotion: Life In The Reef” Part 1: (Reading/Language Arts Connection)

This story lends itself very well to introducing students to some of the marine life found within a coral reef. Use the story to showcase a “Writer’s Toolbox” (bag of tricks). Teachers can use examples from the story to show how writers use descriptive language, action packed words, alliteration, and onomatopoeia to make their stories come alive. Students can then be given opportunities to use these same techniques in their own writing.

C. “Ocean Commotion: Life In The Reef” Part 2: (Reading/Language Arts Connection)

Teach students proper punctuation techniques and strategies for incorporating dialogue into their writing pieces. Allow them to practice in pairs then select a few to come up and write them on the board. Once students have an understanding of how to write dialogue sentences, provide teams with sentences strips. Reread the story to students and afterwards, have them brainstorm what the creatures in the story might be thinking or saying. Students will then write a dialogue sentence for one or more creatures mentioned in the story on the sentence strip. Display sentences in the classroom.

D. Expository Writing Activity: (Language Arts connection)

After teaching about Coral polyps and algae (zooxanthellae), give students an opportunity to explain how these two organisms share a very important relationship that is vital to their mutual survival.

E. **EXTREME Coral Reefs!**(Reading/L. Arts and Science connection)

Like an episode right out of “Animal Planet’s Most Extreme”, introduce students to many of the different creatures that inhabit Biscayne’s coral reef tract. Some of these creatures have unique abilities and peculiar habits that allow them to survive in this ever-changing saltwater habitat.

- Write the names of reef inhabitants on slips of paper (enough for all of your students). Have each student pick one and then challenge them to find out why their creature is the most extreme creature living in the reef. Students may create posters and either write or deliver a short persuasive presentation about why their species is the MOST EXTREME.
- Conduct a class vote to choose the top 3 **most** EXTREME species.

F. **New Species Discovery at Biscayne National Park!** (Science and Fine Arts connection)

Amazingly enough, scientists discover over 10,000 new species each year; creatures or organisms that no one ever knew existed or were only known about locally. Take a moment and have your students imagine what a new species of fish or coral might look like.

Tell students that they will take on the role of a scientist working at Biscayne National Park who has just made the incredible discovery. Unfortunately, they didn’t have a camera with them while exploring the reef so the only way to show the world what they found is by making a 3D model of the new species (since a two dimensional drawing wouldn’t provide enough details). Allow students to use ordinary odds and ends, recycled materials, craft paper, etc., to make their own version of the newly discovered creature.

Students must be able to answer the following questions: What would they eat? What part of the reef would they live on? Who would they depend on for survival? Who would depend on them? Would it have some value for humans, if so, what would that be?

G. **Edible Coral Polyp:** (Science connection)

Background for the teacher: There are many fish that depend on coral as a food source and habitat. One such fish is the amazing parrotfish named so because of its large jaws that look like a parrot’s beak. There are over 14 different species of parrotfish that live in Atlantic coastal waters. Parrotfish use their beaklike jaws to crunch corals and encrusted organisms such as algae, mollusks, and worms. As they sift through the sand and coral they break it down into smaller pieces, creating sand particles that will eventually be deposited onto nearby beaches.

As a review or end of unit, students can create models of an edible coral polyp by using candy pieces (marshmallows, licorice, sprinkles, cake frosting, magic shell syrup, etc.) Once

constructed, they should be able to identify the individual body parts including the zooxanthellae living inside the polyp. Depending on the age group or ability, students can all create the same polyp or allow them to experiment with different “species”. Allow students to eat their polyps just like the parrotfish, but they must place their hands behind their backs since parrotfish don’t have the use of their hands only their parrot-like beaks.

H. **Coral Reef World-Wide Conservation Efforts:** (Reading/L. Arts, Science, Social Studies, and Technology connection)

Divide students into teams and assign each one a different conservation organization to research (see Extension Activities section). Have them summarize their findings in a one-page report about a particular threat to the health or safety of coral reefs, including what is being done to educate people and protect the reefs. Each team will summarize their reports for the class.

I. **Extension Activities:**

- **Coral Reef Connection** - bring the coral reef to you! Schedule a classroom visit with one of our rangers. We will present a hands-on discovery of coral, why it is important and what students can do to keep reefs in Biscayne National Park and around the world healthy.
- Model of a Coral Reef - allow students to build a replica of a coral reef using either modeling clay or paper mache technique. Include the creatures that live or visit the reef.

J. **Critical Thinking Questions for Whole Class Discussion** (end of Field Trip)

- Is a coral a plant or an animal? What are some of the characteristics that distinguish it from other living things?
- What are some human activities that are affecting our coral reefs here in South Florida?
- What would we lose if our coral reefs were destroyed?
- What has been done to educate people to help prevent damage to the reefs?
- Which Biscayne habitat has the highest biodiversity? (Reefs and then the seagrass meadows)

K. **Literature Connections** (suggested trade book titles):

- *Ocean Commotion “Life on The Reef”* by Janeen Mason
- *“Hello Fish!” Visiting the Coral Reef* - National Geographic Society by Silvia A. Earle
- *The Coral Reef* by Jerry and Idaz Greenburg
- *Coral Reefs* (Peterson Field Guides) by Eugene H. Kaplan
- *One Small Square “Coral Reef”* by Donlad M. Silver
- *The Young Wrecker on the Florida Reef* by Richard Meade Bache

L. Web Based Resources:

- Visit Biscayne's website and experience "Coral Reefs of Biscayne National Park" which provides additional background information about corals.
(<http://www.nps.gov/bisc/naturescience/coralreefs.htm>)
- Restoration efforts being carried out at Biscayne National Park - "The Coral Club"
(<http://www.nps.gov/bisc/naturescience/coralnurseryclub.htm>)
- Web Quest Activity for 6th Grade - "Save the Coral Reefs"
(http://www.dade.k12.fl.us/pspringsm/Wilson/save_coral_reefs.html)
- Reef Relief: Protecting Living Coral http://www.reefrelief.org/coral_reef_index.shtml
- NOAA - Images of Florida Reefs: Vertebrates and Invertebrates
(<http://www.photolib.noaa.gov/reef/florida.html>)
- NOAA - Interactive Reef Activity: <http://coralreef.noaa.gov/aboutcorals/interactivereef/>
- NOAA - Resources for Educators: <http://coralreef.noaa.gov/education/educators/>
- Sea Grant - Resources for Marine Educators
(<http://edis.ifas.ufl.edu/pdf/SG/SG04800.pdf>)
- Stanford University Microdocs - What is A Coral?
(<http://www.stanford.edu/group/microdocs/whatisacoral.html>)
- Discovery Learning for Secondary Teachers (<http://www.discoveryeducation.com>)

STATION - Testing the Water (Biscayne Bay, water quality)

Location: North Lawn

Objectives: (Students will)

- Know that to explore the natural world is to observe and record, and then analyze and communicate results.
- Understand that it is important to keep accurate records and descriptions to provide information and clues to causes of discrepancies in repeated experiments.

Science State Correlations:

Big Idea #1 The Practice of Science
Big Idea #2 The Characteristics of Scientific Knowledge
Big Idea #6 Earth Structures

Big Idea #14 Organization and Development of Living Organisms
Big Idea #15 Diversity and Evolution of Living Organisms
Big Idea #17 Interdependence

Summary:

Students will test 3 water samples for salinity. They will use the *Venice System*, just like real scientists, to determine if the salinity levels are where they should be.



Waters of Biscayne Bay (Background Knowledge)

The topography of South Florida is divided into two main regions, the Atlantic coastal ridge, (which roughly follows US1) and the Everglades. The highest point on the coastal ridge is about twenty feet above sea level in Coconut Grove. From this ridge the land slopes eastward to the Atlantic and westward, more gently, to the Everglades. East of the ridge there were areas of sheet flow and numerous small creeks that flowed through marl prairies and mangroves supplying freshwater to Biscayne Bay. Freshwater also entered the bay through overland sheet flows passing through the mangroves and by springs that bubbled up from groundwater. In this environment, systems developed that were capable of tolerating reduced salinity. The dredging of canals diverted the traditional flow patterns, timing, and water quality. Drainage canals and agricultural and municipal uses has disrupted and decreased the amount of freshwater that enters Biscayne Bay thereby increasing salinity levels. Although the bay still sustains several distinct communities, the long-term effects of increased salinities are unknown. This in turn has affected the vast underwater communities that sustain a wide variety of marine life.

Biscayne Bay is a shallow estuarine lagoon, originating north of the boundaries of Biscayne National Park. Many reef dwelling creatures begin life in the shallow waters in the mangroves and seagrass

beds. The bay serves as a nursery to a variety of marine life because of the available shelter and food supply.

The Comprehensive Everglades Restoration Plan (CERP) has been described as the world's largest ecosystem restoration effort. It will take more than 30 years to construct and will cost an estimated \$7.8 billion. This project not only affects the Everglades, it addresses water for all of South Florida including the freshwater flow into Biscayne Bay. One of the major components of CERP is to change surface structures to begin to replicate the historic sheet flow of water that once flowed from north to south.

Suggested Activities for Pre-Site Visit:

A. Introduce Vocabulary (Reading/Language Arts connection)

1. **salt:** a crystal-like compound found in minerals or ocean water.
2. **salinity:** a salty solution; water containing measureable levels of salt content.
3. **estuary:** the widening channel of a river where it nears the sea, with a mixing of fresh water and salt (tidal) water.
4. **marine:** of, found, or relating to the sea
5. **fresh water:** inland water, as ponds, lakes, or streams, that is not salt
6. **canal:** an artificial waterway constructed for navigation, irrigation, or channeling water into the sea
7. **bay:** that part of the mouth of a river in which the river's current meets the sea's tide.
8. **density:** the degree to which something is filled, crowded, or occupied within a space.

B. Compare Fresh and Salt Water Habitats: (Science and Reading/L. Arts connection)

Have students make a two tab foldable booklet. Illustrate the cover so it depicts scenes from both types of habitats (including inhabitants). On the inside, students will list characteristics that distinguish each habitat and include examples of organisms that live in each.

C. Building a Model of a Watershed: (Reading and Science connection)

Water runs downhill due mostly to gravity. By building a model of a watershed, students will benefit from a visual demonstration of how water picks up sediments and pollution as it flows. Use this activity to demonstrate how fresh water inland flows out towards Biscayne National Park (adapt accordingly). Here are two sites that provide directions

www.iwla.org/ht/a/GetDocumentAction/i/2194 or
<http://dendro.cnre.vt.edu/forsite/2002presentations/watershedmodel.htm>

D. Experimenting with Buoyancy: (Math and Science connection)

Demonstrate Archimedes' Principle for students performing a simple experiment with two 8 oz cups filled $\frac{3}{4}$ full of tap water. Mark the water level on the cups. Add 6 teaspoons of salt to one cup and stir until the salt is dissolved. Did the water level change? If it did, mark it on the cup. Now place an egg in each cup and have students observe what happens to the egg. Measure how much water was displaced when the eggs were placed inside the cups. You may use Teachers Domain: Buoyancy Basics or Density and Buoyancy - Making Eggs Float as a visual resource (See Web Resources Section).

E. Investigations with Density: (Science and Math connection)

http://www.sciencebuddies.org/science-fair-projects/project_ideas/OceanSci_p009.shtml

This lab experiment involves the collection of water samples from various locations and calculating the amount of salinity in each. It also requires several weeks of monitoring and data gathering.

F. Critical Thinking Questions for Whole Class Discussion: (end of Field Trip)

- Why has the salinity level of Biscayne Bay changed? (Reduced fresh water flow)
- If the salinity levels continue to fluctuate in an “unnatural” way in Biscayne Bay, what could be an important and devastating consequence?
- What can we do to improve the water quality levels of Biscayne Bay?

G. Literature Connections (suggested trade book titles):

- I Wonder Why The Sea is Salty? by Anita Ganeri
- Awesome Ocean Science (Kids Can! series) by Cindy A. Littlefield
- Eye Wonder: Ocean by Mary Ling
- Ocean (DK Eyewitness Books) by Miranda MacQuitty

H. Extension Activities:

- What Makes Salt Lake Salty? (Reading/L. Arts, Science, and Social Studies - post visit)

(http://learn.genetics.utah.edu/content/gsl/physical_char/)

Teachers can help students discover the science behind what makes Salt Lake in Utah salty. Or perhaps assign it as a research project.

- How are organisms that live in Salt Lake adapted for that environment?
- How is climate change affecting the salinity levels of the Lake?

- How does Salt Lake compare with other Lakes in the region?
 - Where does the water in the lake go?
- Effects of salinity levels on Brine Shrimp Hatchlings: (Science connection - post-visit)

(<http://www.hometrainingtools.com/brine-shrimp-science-project/a/1225/>)

Brine shrimp are crustaceans that are classified in the phylum Arthropoda (the largest phylum in the animal kingdom, which includes insects and other creatures with jointed legs and exoskeletons). They live in inland bodies of saltwater, such as the Great Salt Lake or the Dead Sea, but not in the ocean where they would have too many predators. This experiment would show students how levels of salinity can impact an organism's life cycle and or survival. (Please check with your school district's updated policy on using certain live animals for experimentation in the Science classroom).

- **Estuary Connections** - Schedule a classroom visit with one of our rangers. Students will explore the four main marine ecosystems of Biscayne, the animals that live in them, and how they are connected through this hands-on activity.
- **Classroom Aquarium** - teachers may want students to participate in setting up and maintaining a freshwater classroom aquarium. Look into donations from pet shops, non-profits, grants, and spread the word among your students that you would like a guest speaker - perhaps someone who keeps an aquarium as a hobby would be willing to help.

I. **Web Based Resources:**

- USGS SOFIA (South Florida Information Access) - South Florida's Water http://sofia.usgs.gov/virtual_tour/kids/water.html
- USGS SOFIA (South Florida Information Access) - South Florida's Ecosystem History <http://sofia.usgs.gov/flaecohist/kidscorner/projectinfo.html>
- Teacher's Domain - Free mainstream video, interactive activities, and background information for teachers <http://www.teachersdomain.org/>
- Buoyancy Experiment with Soda Cans <http://mypages.iit.edu/~smile/ph9708.html>
- USGS Water Science For Schools <http://ga.water.usgs.gov/edu/watershed.html>

STATION - The Keys to Plant Identification (Hardwood Hammock, plant identification)

Location: Hammock on southeastern end of parking lot

Activity Summary:

Students will enter a wooded area representative of the hardwood hammock on the keys within the park. Using a plant identification card they will compare and contrast leaves, leaf arrangements and bark in order to identify tree species.

Objectives: (Students will)

- Learn the proper use of a plant identification key while making field observations.
- Explain why all animals depend on plants and site examples of these relationships.
- Students will be able to compare and contrast observations and results as an essential skill in science.

Science State Correlations:

Big Idea #1 The Practice of Science
Big Idea #2 The Characteristics of Scientific Knowledge
Big Idea #14 Organization and Development of Living Organisms

Big Idea #15 Diversity and Evolution of Living Organisms
Big Idea #16 Heredity and Reproduction
Big Idea #17 Interdependence

The Hardwood Hammocks at Biscayne (Background Information)

Further inland from the shore, is the tropical hardwood hammock. A hammock is a hardwood forest of tropical and subtropical vegetation. The word “hammock” comes from a Native American word that means “a shady place”. Hammocks develop on high land and only in areas protected from fire, flood, and saline waters.

Tropical hammocks represent one of the rarest plant communities in Florida. Here are some plants and trees found nowhere else in the United States except South Florida. Hammock plants are found in rocky areas with shallow soil since little soil forms over the coral rock that created the keys. The hammock on Elliott Key represents one of the finest remnants of this ecosystem. Here, plant communities include a variety of tropical West Indian



species, including mahogany, and gumbo limbo. There are over 200 species of plants found in hammocks.

These beautiful jungle-like habitats were once common along South Florida coastlines and many inland areas. Hammocks used to exist throughout the Florida Keys and as far north as Cape Canaveral. During the late 1800s and early 1900s the forests were a source of valuable logging timber such as mahogany. For many years the trees were harvested and used in the production of tons of charcoal. Both human and natural impacts have caused such a serious decline in these habitats that they are currently listed as a threatened habitat type in Florida.

All that remain today of these unusual ecosystems are scattered islands of tropical forest that are mainly located in parks and preserves in South Florida and the Keys. Careful management and preservation of these precious natural wild lands is critical if they are to survive.

Suggested Activities for Pre-Site Visit:

A. Introduce Vocabulary (Reading/Language Arts connection)

1. **Tree Hammock:** Scattered islands of hardwood trees and dense undergrowth which thrive on slightly elevated spots.
2. **Shrub:** A shrub or bush is distinguished from a tree by its multiple stems and shorter in height.
3. **Herbaceous:** is a plant that has leaves and stems that die down at the end of the growing season to the soil level.
4. **Woody:** herbaceous plants that do not have the thickened bark covering, but develop hard stems.

- B. **List of Plants:** the following is a list of plants that students will encounter while walking through the hardwood hammock. At the end of this section, you will find photographic images that you may want to laminate and cut out for your students to examine and become familiar with before their onsite visit.

White Stopper	Sea grape
Cinnamon Bark	Black Ironwood
West Indian Tamarind	Wild Coffee
Gumbo Limbo	Pigeon Plum
Mahogany	Jamaican Dogwood

- C. **Classification of Plants Activity:** (Reading/L. Arts, Science, and Math connection)

<http://www.fairchildgarden.org/uploads/docs/Education/teacher%20training/plant%20kingdom/monocot%20and%20dicot%20characteristics%20handout.pdf>

Using the schoolyard as a classroom, teachers may use or modify Fairchild Garden's resource link to teach students how to classify and identify plants based on their unique or individual characteristics.

D. **Interesting Facts and Common Uses of Florida Native Trees and Plants** (Reading/L. Arts, Science, and Social Studies)

Have students pair up and research some of the most common facts and uses of Florida native plants found in Hardwood Tree Hammocks (both historically and currently). Have them prepare an oral presentation for the class. Include technology in the lesson by having them present using Power Point.

E. **Plant Leaf and Flower Press Activity:** (Science and Fine Arts connection)

Collect various samples of plants and flowers from the schoolyard or you may ask parents or students to donate some for this activity. ***After*** identifying the plant parts and discussing their similarities and differences, have students layout their designs on their desk or table. Once they are happy with their design, spray adhesive glue onto a sheet of cardstock paper. Working in pairs, students will place their plant parts onto the paper and secure in place. Once dry, the cardstock can be laminated using lamination pouches. Display student projects in your classroom.

F. **Critical Thinking Questions for Whole Class Discussion** (end of Field Trip)

- What were some strategies that you used to identify plants/hardwood trees? (Compare and contrast)
- Why is it important to preserve hardwood tree hammocks? What is the value for animals and humans?
- Why are plants so important to all living things? (produce oxygen, provide source of food/energy, shelter, resources, etc.)

G. **Literature Connections** (suggested trade book titles):

- The Young Naturalist's Guide to Florida by Peggy Sias Lantz and Wendy A. Hale
- Florida's Fabulous Trees by Winston Williams
- Florida's Fabulous Flowers by Winston Williams

H. **Web Based Resources:**

- Tropical Hardwood Hammocks
<http://www.deeringestate.com/uploads/Tropical%20Hardwood%20Hammocks%20LP.pdf>
- Web of Life in a Forrest Activity (adaptable to a Tree Hammock Environment)
<http://www.talkabouttrees.org/docs/lesson1.pdf>
- Tropical Fairchild Botanical Garden
<http://www.fairchildgarden.org/education/downloadableteachingmodules/>

- UF/IFAS Florida Extension Office
http://livinggreen.ifas.ufl.edu/landscaping/using_native_plants.html

**JAMAICAN
DOGWOOD**



**BLACK
IRONWOOD**



SEA GRAPE



MAHOGANY TREE



WILD COFFEE



**GUMBO LIMBO
TREE**



PIGEON PLUM



**WEST INDIAN
TAMARIND**



**CINNAMON
BARK TREE**



**WHITE STOPPER
TREE**



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