



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

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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.

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.

The Biscayne Explorer Program

The Biscayne Explorer program is a land-based day program developed to introduce 4th and 5th graders to Biscayne National Park's four interdependent ecosystems. The program correlates to the Sunshine State Standards for *Processes of Life, How Living Things Interact with Their Environment* and *the Nature of Science*. The program looks to establish in students some basic nature study habits and scientific process skills through plant and animal identification and inventory. In addition students will participate in activities similar to those conducted by park scientists. Last, but certainly not least, Biscayne Explorer looks to provide students with a positive environmental education experience.

Teacher Workshop

To help teachers prepare for their fieldtrip it is recommended they attend a one day on-site workshop prior to participating in Biscayne Explorer. The purpose of the workshop is to assist teachers in becoming familiar with their responsibilities and the program logistics; as well as how to prepare their students and chaperones for the field trip.

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.

Objectives

Upon completing the program the students will be able to:

1. Identify how organisms get the energy they need for survival.
2. Explain the concept of interdependence and state at least two ways the health of one of the ecosystems depends on the health of another.
3. Identify similar structures in different species of organisms.
4. Name three adaptations organisms in Biscayne National Park have to assist them in survival.
5. Describe how all animals depend on plants.
6. Use observation skills to explore the natural world, record finding and communicates the results. Students can relate this essential skill to real research done in the park.
7. Explain the value of keeping accurate records in research and can relate this to real research done in the park.
8. Describe how material is recycled in the natural world and the role of decomposers in this process.
9. Identify the four ecosystems of Biscayne National Park.
10. 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.

Explorer Stations

1. The Keys to Plant Identification (Hardwood Hammock, plant identification)
2. Living on the Edge (mangroves, adaptation)
3. The Seagrass Connection (seagrass, food webs, energy)
4. Testing the Water (Biscayne Bay, water quality)
5. Bird and Fish Count (wildlife inventory, identification)
6. I Got A Friend In Me (coral reef, adaptation)

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 Depart

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.

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.

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 12 students (although 10 is the preferred number) and at least one teacher or chaperone. Partners and name tags are also recommended.

Scheduling your field trip

You can register for the program by calling (305)230-1144 x 3078. 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.

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.

- Make the trip a part of a unit of study. Language arts, fine arts and social studies as well as science can be taught on field trips to the Park.
- 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, familiarize yourself with the Park and Biscayne Bay, plan to look for specific things on the trip.
- Make sure your group understands the program logistics.
- Maintain close communication with your ranger.

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

(Educator Outlines provide detailed activity information)

Activity Number: 1

Title: Living on the Edge

Location: Western most point of jetty, off the boardwalk

Objectives:

(Students will)

- know that living things compete in a climatic region with other living things and structural adaptations make them fit for an environment.
- know 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.

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.

Activity Number: 2

Title: Bird and Fish Count

Location: Boardwalk

Objectives:

(Students will)

- know that a successful method to explore the natural world is to observe and record, and then analyze and communicate results.
- know that all living things are different but share similar structures.
- know that to compare and contrast observations and results is an essential skill in science.

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.

Activity Number: 3

Title: The Keys to Plant Identification

Location: Hammock on southeastern end of parking lot

Objectives:

(Students will)

- know how all animals depend on plants.
- know that to compare and contrast observations and results is an essential skill in science.

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.

Activity Number: 4

Title: I've Got a Friend In Me

Location: East Lawn

Objectives:

(Students will)

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

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.

Activity Number: 5

Title: Testing the Water

Location: North Lawn

Objectives:

(Students will)

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

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.

Activity Number: 6

Title: The Seagrass Connection

Location: Beginning of blue boardwalk bridge

Objectives:

(Students will)

- know ways that plants, animals, and protists interact.
- know that animals eat plants or other animals to acquire the energy they need for survival.

Summary:

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

Critical thinking questions:

Who depends on plants? (All animals)

What do all animals need to survive? (Food, water, shelter, space)

How did you identify the hardwood trees? (Compare and contrast)

What does a habitat provide? (Food, water, shelter, space)

What role do mangroves serve? (Prevent erosion, provide shelter, provide detritus)

Why has the salinity level of Biscayne Bay changed? (Reduced fresh water flow)

Why would a bay full of nothing but dolphins be bad? (Biodiversity)

Why do animals need something to eat them? (Population control)

What is species richness? (Level of species variety)

What is a coral? (A colony of tiny animals called coral polyps)

Which Biscayne habitat has the highest biodiversity? (Reef and then the seagrass meadows)

How would a change in fish populations directly affect our lives? (Commercial fishing, tourism)

Biscayne NP has the longest stretch of undeveloped mangrove shoreline. What is undeveloped?

Florida Sunshine State Standards Met:

Processes of Life

Standard 1:

The student describes patterns of structure and function in living things. (SC.F.1.2)

1. knows that the human body is made of systems with structures and functions that are related.
2. knows how all animals depend on plants.
3. knows that all living things are different but share similar structures.
4. knows that similar cells form different kinds of structures

Standard 2:

The student understands the process and importance of genetic diversity. (SC.F.2.2)

1. knows how all animals depend on plants.

How Living Things Interact with Their Environment

Standard 1:

The student understands the competitive, interdependent, cyclic nature of living things in the environment. (SC.G.1.2)

1. knows ways that plants, animals, and protists interact.
2. knows that living things compete in a climatic region with other living things and structural adaptations make them fit for an environment.
3. knows that green plants use carbon dioxide, water, and sunlight energy to turn minerals and nutrients into food for growth, maintenance, and reproduction.
4. knows that organisms decompose dead plants and animals into simple minerals and nutrients for use by living things and thereby recycle matter.
5. knows that animals eat plants or other animals to acquire the energy they need for survival.
6. knows that organisms are growing, dying and decaying and that new organisms are being produced from the materials of dead organisms.
7. knows that variations in light, water, temperature, and soil content are largely responsible for the existence of different kinds of organisms and population densities in an ecosystem.

The Nature of Science

Standard 1:

The student uses the scientific processes and habits of mind to solve problems. (SC.H.1.2)

1. knows that it is important to keep accurate records and description to provide information and clues on causes of discrepancies in repeated experiments
2. knows that a successful method to explore the natural world is to observe and record, and then analyze and communicate results.
3. knows that to work collaboratively, all team members should be free to reach, explain, and justify their own individual conclusions.
4. knows that to compare and contrast observations and results is an essential skill in science.
5. knows that a model of something is different from the real thing, but can be used to learn something about the real thing.

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.

Water Flow

Before discussing the habitats, water flow needs to be mentioned. 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. Historically, upwellings in the bay were also a freshwater source. The dredging of canals diverted the traditional flow patterns, timing, and water quality. Today, fresh water enters the bay through these canals and the salinity of the bay has increased. This in turn has affected the vast underwater communities that sustain a wide variety of marine life.

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.

The Four Ecosystems of Biscayne National Park

The Mangrove Shoreline

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.

Biscayne Bay

Throughout its history, Biscayne Bay has received freshwater from the same system that sustains the Everglades. Freshwater 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. This saturation has changed. A system of drainage canals and agricultural and municipal uses has disrupted and decreased the amount of freshwater that enters Biscayne Bay. Although the bay still sustains several distinct communities, the long-term effects of increased salinities are unknown.

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.

Seagrass Meadows

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.

The Keys

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 plants and animals of the interior. Mangroves are often the first plants to claim land from the sea, and prevent the land from eroding once in place.

Further inland from the shore, is the tropical hardwood hammock. Here are some plants and trees found nowhere else in the United States except South Florida. 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. Hammocks used to be found throughout the Florida Keys and as far north as Cape Canaveral.

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. Hammock plants are found in rocky areas with shallow soil since little soil forms over the coral rock that created the keys.

Coral Reefs

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 runoff 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.