

# Welcome!

Dear Teacher:

Thank you for planning a field study to Fairchild Tropical Botanic Garden. The tour you have selected, **Where We Live**, is designed to teach students about South Florida's subtropical environment, the great diversity of our native plant life, and the importance of preserving our natural habitats.

Your visit will include a tram tour through the entire Garden followed by a guided walking tour through our pine rockland and mangrove forest exhibits. Lunch will be followed by a plant propagation lesson and each student will take home a botanical souvenir.

This packet of activities contains pre and post-visit resource materials to support the learning experience. **We strongly encourage you to review and use these materials to make the most of your students' field study at Fairchild.** The activities correlate to Florida's Next Generation Sunshine State Standards for fourth grade. **Please be sure that each teacher attending the field study receives an activity packet.** Feel free to make additional copies of this packet as needed, or visit [www.fairchildgarden.org/education](http://www.fairchildgarden.org/education) to view the activities online.

The **word list** provided is especially important for students to study prior to their visit. An understanding of the vocabulary will be a great asset in comprehending the concepts discussed during the field study.

We look forward to your visit to Fairchild Tropical Botanic Garden and hope that you and your students will have an exciting and educational adventure.

Kind Regards,

*The Explorer Team*

Fairchild Tropical Botanic Garden  
305.667.1651, ext. 3322

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# Introduction

*This unit has been prepared to help you and your students learn about native South Florida ecosystems, and to optimize the learning experience during your field study at Fairchild Tropical Botanic Garden. These multidisciplinary activities were designed for students in fourth grade, and are aligned to Florida's Next Generation Sunshine State Standards for **fourth grade**. At the end of the unit you will find useful websites for further information on South Florida's diverse ecosystems.*

The Florida peninsula rose out of the ocean later than the rest of the North American land mass, about one million years ago. During the Great Ice Age, rising and falling waters from melting glaciers created a unique environment. Skeletons and shells left behind by receding waters formed a deep layer of limestone rock that covered most of the Florida peninsula. Along the eastern rim of Florida is a higher elevation of rockland known as the Atlantic Coastal Ridge. West of this ridge is the Everglades. The swampy area is actually a fresh water river that flows south from Lake Okeechobee to the Gulf of Mexico and Florida Bay. Known as the river of grass, the Everglades is our source of water for drinking, bathing and watering our plants. There are no other Everglades on Earth! Conservation of the Everglades is important to life in South Florida.

Our location, at the crossroads of the temperate and tropical zones, produces a warm sub-tropical climate, with wet, humid summers and cool, dry winters. More species of plants grow here than in northern temperate zones, creating a lush environment, unique in the world. It is a beautiful and exciting place, a home for plants, birds, fish, butterflies, and animals (including humans)!



*A cypress stand in Big Cypress National Park*

# Words for a Day at Fairchild

**Brackish** - a combination of salt and fresh water.

**Canopy** - the highest level of plant growth in a forest.

**Consumer** - an organism that feeds on plants and/or animals.

**Decay** - the slow break down (decomposition) of plant material.

**Ecosystem** - a community of animals, plants and microscopic life that interact together in the environment.

**Elevation** - the rise of land that is measured by units above sea level.

**Epiphyte** - a plant that grows on another plant or tree; it derives its nutrients from the rain and debris that fall into it.

**Erosion** - the wearing away of the land by water or wind.

**Estuary** - an aquatic area in which fresh water from rivers mixes with salt water from the ocean.

**Exotic** - having been introduced to an area where the organism would not naturally be found.

**Food Web** - a series of interconnected food chains that show predator-prey relationships.

**Hammock** - an area of higher ground that supports a community of plants that are different from those in lower elevations.

**Marl** - soil that contains limestone.

**Native** - the area where an organism originated; plants that have lived in South Florida for hundreds of years and were not introduced to the area by humans.

**Peat** - rich soil made up of decomposing plants.

**Producer** - an organism that produces its own energy, such as photosynthetic plants.

**Understory** - the plant layer growing under the canopy, made up mostly of young trees and shrubs.



*Epiphyte on tree*

# Pre-visit Activity:

## South Florida's Ecosystem News

### Objective

Students will identify the major characteristics of various South Florida ecosystems. Students will research one of three ecosystems native to South Florida and produce a collaborative creative writing piece which they will present and share with their peers.

**Next Generation Sunshine State Benchmarks:** SC.4.N.1.1, SC.4.N.1.4, SC.4.N.1.5, SC.4.N.1.6, SC.4.E.6.6, LA.4.1.6.1, LA.4.1.6.2, LA.4.1.6.3, LA.4.1.6.4, LA.4.1.6.5, LA.4.1.6.10, LA.4.2.2.1, LA.4.2.2.2, LA.4.2.2.3, LA.4.2.2.5, LA.4.3.1.1, LA.4.3.1.2, LA.4.3.2.1, LA.4.3.2.3, LA.4.3.3.1, LA.4.3.3.3, LA.4.3.4.1, LA.4.3.4.2, LA.4.3.4.3, LA.4.3.4.4, LA.4.3.4.5, LA.4.3.4.6, LA.4.3.5.1, LA.4.3.5.2, LA.4.3.5.3, LA.4.4.1.1, LA.4.4.1.2, LA.4.4.2.1, LA.4.4.2.2, LA.4.4.3.1, LA.4.4.3.2, LA.4.5.2.1, LA.4.6.1.1, LA.4.6.2.1, LA.4.6.2.2, LA.4.6.2.3, LA.4.6.2.4, LA.4.6.3.2, LA.4.6.4.1, LA.4.6.4.2, SS.4.A.1.1, SS.4.A.1.2, SS.4.A.4.2, SS.4.G.1.1, SS.4.G.1.3

### Vocabulary

canopy	decaying	epiphyte	hammock	understory
elevation	erosion	marl	peat	pinnacles
brackish	estuary	pneumatophores		

### Materials

"Words for a Day at Fairchild" (page 4)

"South Florida's Native Ecosystems" (pages 6-8)

Unlined paper

Pencils/crayons/markers

Resource materials (Internet, encyclopedias, newspaper articles, etc.)

### Procedure

1. As a class, read and discuss the information on each of the three ecosystems. Use the handouts on pages 6-8.
2. Divide the class into groups of 4-5 students. Each group will develop a community newspaper for a specific South Florida ecosystem.
3. Students may use the Internet, encyclopedias, etc., to conduct research on their specific ecosystem. The websites listed on pages 14 and 15 are a good place to start.
4. Consider assigning sections to each student in the group such as history, real estate listings (who would depict what types of shelters the animals live in), current events, restaurants (what do the animals in the ecosystem eat?), etc.
5. The newspaper students produce may include articles, poems, advertisements, puzzles, drawings and photographs depicting different aspects of the environment including plants and animals within the ecosystem. Exploring current events and controversies should be followed by class discussion.
6. Ask student groups to circulate their papers around the class and present their ecosystems to each other with time for questions and answers. Which ecosystem would students like to live in?

# South Florida's Native Ecosystems

## Tropical Hardwood Hammock

Along the coast of South Florida, throughout the Everglades and the Florida Keys, exists dense, tropical forest ecosystems that are called **tropical hardwood hammocks**. These communities are dominated by a variety of large trees growing on a natural rise in the limestone that is approximately 1 to 2 feet above the surrounding land. Due to the increased elevation, **tropical hardwood hammocks** seldom flood during the summer rainy season.

Many of the trees that grow well in hammocks are of West Indian or Caribbean origin, such as: Mahogany, Gumbo Limbo, Cocoplum and Wild Tamarind. In fact, many of South Florida's **tropical hardwood hammock** communities closely resemble the coastal hardwood forests of the Bahamas. Scientists hypothesize that the initial seeds from these trees were brought to South Florida shores by ocean currents, hurricanes and migratory birds. Eventually, these seeds took root in the rocky soil. The tropical hardwood trees flourished because they have sprawling, shallow roots that are able to search for water and soil in the limestone cracks. Over 200 species of native Caribbean trees have been found growing in **tropical hardwood hammocks**. Some temperate zone trees, including Live Oak, also thrive in these areas.

The uneven forest floor is covered by loose rock, a decaying layer of leaves and other organic materials that have built up over many years. These organic materials become very acidic and eventually eat away the limestone, causing it to collapse and form "solution holes". During most of the year, these solution holes are filled with soil and organic materials. During the rainy season, however, the solution holes fill with water. The moisture from the solution holes in combination with the dense canopy create an area in the understory that is breeze-free and extremely humid. The high humidity helps prevent fires from spreading in these areas.

A variety of shrubs, ferns, vines and bromeliads contribute to a hammock's jungle-like appearance. Some plants called epiphytes grow on other plants without any soil! One of the better-known epiphytes is Spanish Moss, which is not really a moss, but is actually in the same family as the pineapple. Orchids are some of the best known and most showy of the epiphytes. Some shrubs that grow in **tropical hardwood hammocks** may include Devil's Claw, Wild Coffee and Red Mulberry.

# South Florida's Native Ecosystems

## Pine Rockland

**Pine rocklands** are unique to South Florida and the Bahamas. This ecosystem consists of a land surface that is very dry, rocky and pitted. Elevation is about 3 to 6 feet above sea level and includes some of the highest and driest areas in South Florida. The exposed limestone surface of this ecosystem is formed into sharp pinnacles after many years of erosion. Solution holes are also common. Marl (limey, organic mud) or peat (rich, organic material) lie on top of the limestone and provide enough soil for plants to take root. The dominant tree of the pine rockland– the Florida Slash Pine or Dade County Pine– has roots that grow quite well in this type of rocky ground. Growing among the pines are Sabal Palms, Saw Palmettos, Coonties, shrubs, palms and herbs.

**Pine rocklands** depend upon fire for their survival. In South Florida, fires caused by lightning strikes during summer thunderstorms are common. Without these fires to destroy the fast growing hardwood tree seedlings, the slow growing pine trees would not be successful. A tropical hardwood hammock ecosystem would be created instead of the continuation of the **pine rockland** ecosystem. Plants in a **pine rockland** have adaptations for survival during and after a fire. The multi-layered bark of the Slash Pine provides protection to the inner portion of the tree trunk. Coontie is a species of cycad that survives fire due to its large underground stem. In both cases, fire destroys only a part of the plant. The main parts of the plant that are needed for survival remain unharmed.

Many of these areas have already been lost to development, agriculture, fire suppression, and invasive species. There are only a few large pine rockland areas that remain under protection. Smaller pieces of land are scattered throughout South Florida and are still in danger of being destroyed.

*The caterpillar of the Atala butterfly feeds exclusively on the Coontie plant that grows in the pine rocklands.*



# South Florida's Native Ecosystems

## Mangrove Forest

**Mangrove forests** cover most of the southern tip of Florida. In these ecosystems, fresh water from the Everglades meets with salt water from the ocean and creates a brackish water estuary. Red, Black and White Mangroves are the main plants that grow here. Mangroves appear to grow right out of the water along the coast. They are adapted to survive in areas where the environment is constantly changing.

Each type of mangrove grows in a specific part of the forest. Red Mangroves have stilt-like prop roots that hold them firmly at the water's edge. Black Mangroves have root parts called pneumatophores that need to be exposed to the air. Black Mangroves require a slightly higher elevation of land and are located further inland from the Red Mangroves. White Mangroves are less common. They grow the furthest inland, in the portion of the mangrove forest that is farthest away from the water. Other plants in this ecosystem may include Buttonwood (which is related to the White Mangrove), Poisonwood and Manchineel.

The **mangrove forest** estuary serves as an important nursery for shrimp, crabs, fish and other sea life. During the winter, many wading birds come to South Florida to nest in the **mangrove forest**.



*The prop roots of these Red Mangroves form a protected habitat for many different animals looking to escape large predators.*

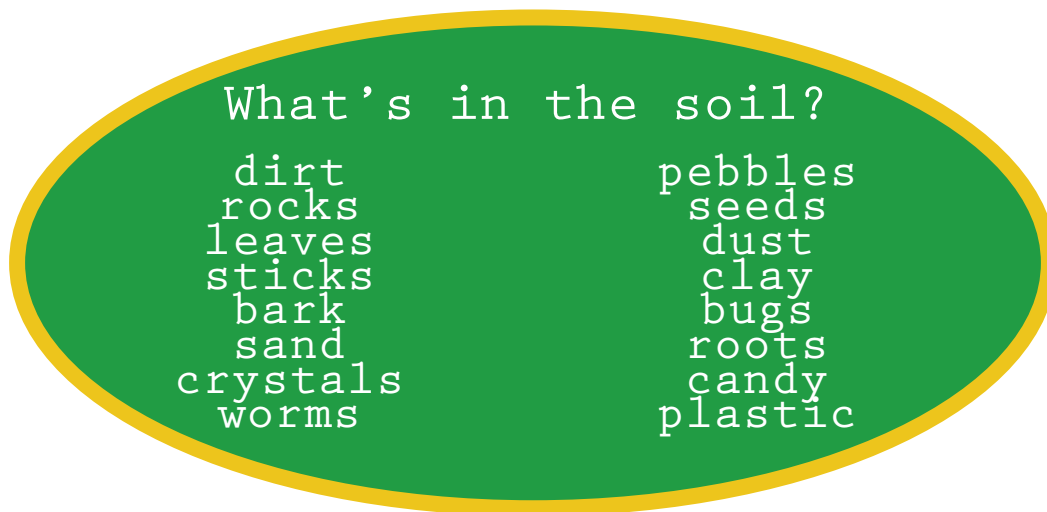
# Pre-visit Activity:

## Soil Detectives

### Objective

Different ecosystems have different soil types. The types of plants and animals that can be supported in an ecosystem depends, in part, on the components of the soil. Students examine a sample of soil and sort the various components to discover the variety of items that make up soil. Students will also classify soil components into two major categories: plant and mineral.

**Next Generation Sunshine State Benchmarks:** SC.4.N.1.1, SC.4.N.1.2, SC.4.N.1.4, SC.4.N.1.5, SC.4.N.1.6, SC.4.E.6.2, SC.4.E.6.4, SC.4.E.6.5, SC.4.E.6.6, SC.4.P.8.1, SC.4.P.9.1, SC.4.L.16.2, SC.4.L.17.4, LA.4.1.6.1, LA.4.1.6.4, LA.4.1.6.5, LA.4.4.2.2, LA.4.5.2.1, LA.4.5.2.2, LA.4.5.2.3, LA.4.5.2.4, LA.4.5.2.5, SS.4.G.1.3, MA.4.A.6.6



### Materials

4 soil samples (about 3 cups each)  
Plastic spoons

Magnifiers

Popsicle sticks  
Bug box

Poster board

Blank paper

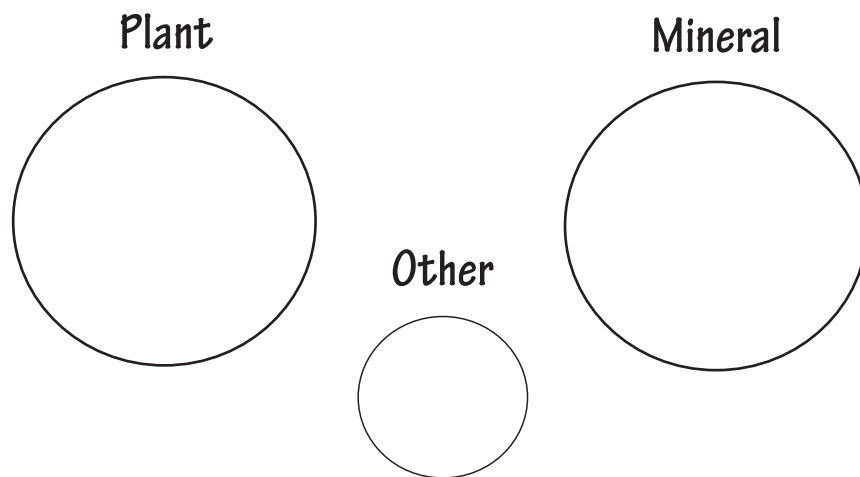
Pencils/crayons/markers

### Procedure

1. Before class begins, collect soil samples from several areas that haven't been watered recently. Dry soil is easier to sort.
2. Make a chart entitled "What's in the Soil?" on the board. (See list above for some examples). On another board, make a line dividing the space in half vertically. Title the left side of the chart "Plant" and "Mineral" on the right side.
3. Ask the class why they think soil is important, i.e., plants grow in it, we walk on it, animals live in it, etc. Point out that soil is a mixture of many different things, some of which traveled many miles before ending up in the schoolyard.
4. Ask the students to predict items they might find in a spoonful of soil and list these on the "What's in the Soil?" chart. This list will give everyone ideas about the things they might find in their own samples.
5. Explain that scientists and farmers talk about the soil because the quality of the soil's ingredients

determines the quality of the plants that grow in it. Review the needs of plants with the students, emphasizing water and nutrients, both of which are held in the soil. An even mixture of plant and mineral debris is best.

6. Define the term “plant” as items that came from plants such as roots, leaves, sticks, seeds, and bark. “Minerals” constitute rocks, sand, pebbles, crystals and clay, all of which are important for plant growth.
7. Divide the students into groups and explain that each group will study a small soil sample, sorting their items into the two major categories: plant and mineral. Each group will receive a blank piece of paper and will draw two big circles (see example below). Label one “plant” and the other “mineral”. Show the students that they will use their toothpicks to drag an item, such as a leaf over to the plant circle, or a pebble to the mineral circle. If there is an item doesn’t fall into those categories (e.g., a dead animal, trash), tell the students to draw a third circle and label it “other”.
8. Distribute the equipment and direct everyone to collect their soil samples and place a spoonful of soil between the two circles. Distribute one magnifier to each group. As you circulate among the class, ask students why they sorted particular items in the “plant” or “mineral” category.
9. If students find any critters, point out that most soil organisms are good and harmless. Encourage children to gently collect their critters in a “bug box” to share with the group, and release at a later time.
10. Ask how their soil samples compare with the class’s predictions. Did they find examples of each thing listed under “What’s in the Soil?” What new kinds of items did they find? Were there items that didn’t fit in either the “plant” or “mineral” category (toys, trash)?



### Analyzing the Data

1. Ask a group to share the items they found and how they classified it: plant or mineral. Write it in the appropriate column. Now ask for a show of hands of those students who also found this material in their sample. Record this number next to the item.
2. Once the entire class has reported their results, discuss the following findings:
  - \* What soil item was reported most often? What item was reported least often?
  - \* Which category had the most items?
  - \* What type of soil would be better for growing plants? Why?
3. Ask students to create a two-part name for their soil, using a plant and a mineral characteristic (leafy-sand or twiggy-clay).

# Post-visit Activity:

## Mangrove Connections

### Objective

Students will understand the feeding relationships among organisms found in mangrove ecosystems. Students will also identify the flow of energy within the mangrove food web.

**Next Generation Sunshine State Benchmarks:** SC.4.N.1.1, SC.4.N.1.2, SC.4.N.1.4, SC.4.N.1.5, SC.4.N.1.6, SC.4.E.6.6, SC.4.L.16.2, SC.4.L.17.2, SC.4.L.17.3, SC.4.L.17.4, LA.4.1.6.1, LA.4.1.6.5, LA.4.5.2.1

### Vocabulary

organism	herbivore	carnivore	
omnivore	decomposer	mangrove	
primary producer	primary consumer	secondary consumer	tertiary consumer

### Materials

Large sheet of unlined white paper	Pencils	Crayons/markers
Construction/unlined paper	Tape or glue	Scissors
"Food Web Questionnaire" handout (page 13)		

Three species of mangrove are found in Florida: the Red Mangrove, Black Mangrove and White Mangrove. Typically, Red Mangroves grow along the water's edge, Black Mangroves grow on slightly higher elevations than the Red Mangrove and White Mangroves grow upland from the red and black species. Mangrove litter such as leaves, wood, flowers, propagules and leaf scales fall into the water and are decomposed by fungi and other microorganisms, forming detritus, which forms the basis of an elaborate food web.

Energy flow can be traced through this food web by using a Trophic Level Pyramid. Plants are at the bottom of the pyramid as producers, they are the most energy efficient. The upper levels include the herbivores (primary consumers), the omnivores (secondary consumers), and at the top of the pyramid are the carnivores (the tertiary consumers). As you move up the pyramid, a large amount of energy is lost to the environment. Animals use this energy for activities such as keeping warm and moving. Plants and other organisms that get their energy directly from the sun are the most energy efficient. Carnivores are the least energy efficient.



## Procedure

1. Ask the students, "What is a mangrove?", and encourage discussion.
2. Draw a sample food chain on the board (sun -> leaf -> snail -> fish -> bird).
3. Introduce the concept of energy flow through this chain from primary producers through carnivores using a Trophic Level Pyramid.
4. Divide the class into groups of 4-5 students.
5. Using the list below, ask the students to write the name of each organism on a sheet of construction or unlined paper.
6. Cut the names out and arrange them into a food web on the larger piece of white paper.
7. Encourage the students to discuss the connections between the organisms: Who eats whom? Can more than one animal eat the same plant? Can more than one predator eat the same animal? Note that the producers should be near the bottom, followed by the herbivores and then the carnivores near the top. Do not expect each group to have the exact same arrangement.
8. After each group has finished potential connections, attach the labels to the larger piece of white paper using glue or tape.
9. Draw arrows to connect the organisms and represent the food links. Note that the direction of each arrow should show the direction of energy being transferred through the food web.
10. After students have completed this activity, distribute the "Food Web Questionnaire". Students may continue to work in groups using the food web they have created to answer the questions. In a full class discussion, review the differences between groups and how all natural systems are connected.

*Using the following organisms, develop a food web that might be found in a mangrove ecosystem.*

<b>Plant Species</b>	Red Mangrove, White Mangrove, Black Mangrove
<b>Animal Species</b>	Mangrove Butterfly, Ant, Worm, Spiny Lobster, Blue Land Crab, Shrimp, Killifish, Mosquito, Great Blue Heron, Red-Shouldered Hawk, King Fisher, Mangrove Snapper, Crocodile, Raccoon, Tarpon, Human, Green Anole
<b>Fungi &amp; Bacteria</b>	Fungi & Bacteria (decomposers)

Name \_\_\_\_\_

Date \_\_\_\_\_

# Where We Live

## Food Web Questionnaire

1. Name 2 primary producers found in your food web.

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2. Name 2 herbivores found in your food web.

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3. Name 2 consumers found in your food web.

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4. Which trophic level has the most energy? Which level has the least energy?

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5. Why is energy lost at each trophic level?

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6. What might happen to the food web if the fish disappeared?

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7. Suppose a parasite destroyed most of the mangrove trees. What would happen to the rest of the community?

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# Websites for More Information

## General South Florida Sites

### **Florida Department of Environmental Protection Kid's Page**

<http://www.dep.state.fl.us/secretary/kids/>

Learn about Florida's natural environment through quizzes, crossword puzzles and word scrambles, coloring pages, postcards, etc. Site also contains an environmental glossary, online activities, printable worksheets and information on environmental activists like Majory Stoneman Douglas and John Muir. There is also a site for teachers to use which includes professional development and classroom materials:

<http://www.dep.state.fl.us/secretary/ed/lifeprogram.htm>

### **The U.S. Geological Survey's SOFIA Kid's Page**

[http://sofia.usgs.gov/virtual\\_tour/kids/](http://sofia.usgs.gov/virtual_tour/kids/)

This website offers information on all of South Florida's native ecosystems and the native animals that live there. Site contains photos, coloring pages, and downloadable fact sheets.

### **Florida's Green Swamp**

<http://www.swfwmd.state.fl.us/education/interactive/greenswamp/greenswamp.html>

Go on a virtual tour and view an interactive map of Florida's Green Swamp.

## Sites with Information on the Everglades

### **Comprehensive Everglades Restoration Plan Official Website**

<http://www.evergladesplan.org>

The official website for the Everglades Restoration Plan. This site contains general information on the Everglades, an Everglades newsletter, educator resources, and free downloadable teaching materials. Be sure to also visit the Everglades Reading List which includes books for students of all ages:

[www.evergladesplan.org/read/Default.aspx](http://www.evergladesplan.org/read/Default.aspx).

### **EVERGLADES Digital Library**

<http://everglades.fiu.edu/>

Online clearinghouse for information about the Everglades and the South Florida environment. Includes educational and interpretive materials, natural history writings, scientific articles, maps, photos, and a directory of other Internet sites relating to the greater Everglades. This site is maintained by Florida International University.

### **Florida Invaders**

<http://www.nps.gov/ever/naturescience/floridainvaders.htm>

Lots of information on exotic species that are threatening the Everglades. Site contains downloadable materials and information on invasive insects, reptiles, amphibians, fish and plants. Students can also report sightings of invasive species.

# Websites for More Information

## Sites with Information on Student Activism

### **Be a Junior Ranger**

<http://www.nps.gov/ever/forkids/beajuniorranger.htm>

National Park Service website provides information on how to become a “Junior Ranger” while visiting South Florida’s National Park. Site contains downloadable activity book, available in three languages (English, Spanish, and Haitian Creole).

### **Young Friends of the Everglades**

<http://everglades.org/young-friends/>

A non-profit organization formed to help protect and restore the Everglades. Students and/or classes may become “Young Friends of the Everglades”. Site contains action alerts, fundraising opportunities, videos and articles pertaining to current Everglades conservation issues.