



SOUTH FLORIDA ECOSYSTEMS



Welcome!

Welcome to Fairchild Tropical Botanic Garden! We ask that you please read the following rules to your group before you begin your tour.

- Stay with your group during your entire visit.
- Respect our wildlife; do not touch, chase, or feed the animals.
- Walk only on designated paths or grass.
- Do not climb trees or pick flowers or fruits from plants.
- Keep your voices low to respect other guests.
- Self-guided groups are not allowed at the Garden Cafe, in the Gift Shop or on the Tram.

In your backpack, you will find the materials needed for this program. Before leaving the Garden, we ask you to please ensure that all the materials are back in this backpack. At the end of your visit, return this backpack to the Visitor Center. If any materials are lost or damaged, the cost will be deducted from your deposit.

ACTIVITY SUPPLIES:

- 6 South Florida Ecosystems Program booklets
- 6 laminated *Plant ID Guides*
- 6 laminated *Identifying Native Plants* dichotomous keys
- Folder with worksheets
 - *Investigating Ecosystems* Worksheets
 - Sensory Observations
 - Soil Observations
 - Meet a Native Worksheet
- Clipboards

Get Started

1. Review the South Florida Ecosystems Introduction, Vocabulary list, Activities Descriptions, and field guides included in the backpack.
2. Using the map, locate and proceed to the pine rockland exhibit.
3. While there, use the Activity Description to complete the corresponding worksheets.
4. After completing activities in the pine rockland, proceed to the mangrove ecosystem marked on the map, and use the Activity Description to complete the corresponding worksheets.
5. Next, proceed to the hardwood hammock ecosystem marked on the map, and complete the corresponding worksheets while there.
6. Use the map to navigate back to the Visitor Center after you have visited all three ecosystems.

Before leaving the Garden, don't forget to:

1. Look for the survey that is inside the backpack. Your feedback is appreciated and it helps us improve our program! Please make sure to complete the survey and put it back in the program backpack.
2. Return the backpack to the Visitor Center entrance where you picked it up.

Program Objectives

Participants will:

- Become familiar with native plants found in various ecosystems.
- Learn to identify key species in each ecosystem and their ecological role.
- Learn what are the key characteristics of each ecosystem.
- Understand why each ecosystem is important.
- Understand what are some of the threats that each ecosystem is facing.
- Reflect on what they can do to help conserve these precious ecosystems.

How to use the map?

Orient your map to the location where you are at. As your group is walking, try to pay attention to any landmarks found around you and try to locate them on the map.

We have pre-selected areas in the Garden that are suited for the activities in this packet. These areas are designated on the map with a color coded star.



Introduction

Welcome to the South Florida Ecosystems Program at Fairchild Tropical Botanic Garden! Today you will learn about three South Florida ecosystems -hammocks, pine rocklands and mangroves- and their importance. The hands-on activities found in this packet will immerse you in the world of real scientists and how they study these diverse ecosystems.

What is an ecosystem?

An ecosystem is a biological environment consisting of all the living (biotic) organisms in a particular area, as well as all the nonliving (abiotic), physical components of the environment with which the organisms interact, such as air, soil, water and sunlight.

Habitat Descriptions

Pine Rocklands

- **General Description:** Pine rocklands are found on limestone bedrock on the Miami Rock Ridge and in the Florida Keys. This ecosystem once covered 382,000 acres on the southern tip of the Florida peninsula and the lower Keys, but has now been reduced to only 2% of its original extent. Pine rocklands are fire dependent, which means that periodic fires are required in order to eliminate invading hardwoods and assist in nutrient cycling. Fire helps the pine rocklands by aiding seed germination and reducing the number of exotic plant species. Ashes from the fires recycle back into the earth and provide nutrients for the plants. Therefore many plants in the pine rocklands are fire tolerant and will recover quickly from burning.

- **Wildlife:** Pine rocklands are dominated by one species of pine tree, the South Florida slash pine (*Pinus elliottii* var. *densa*). The forest floor has various shrubs, herbs and palms, as well as young hardwoods. Saw palmetto and coontie are common understory plants in the pine rocklands. Many endemic plants are found here. Pine rockland plants provide critical foraging and nesting habitat for a diverse array of wildlife including the endangered Key deer and Lower Keys marsh rabbit, birds such as the white crowned pigeon and the scrub jay, as well as various threatened species of snakes, tortoises, lizards, and insects.

- **Major Threats:** Pine rocklands have been heavily impacted by development and fire suppression. Before scientists fully understood the role of fire in pine rocklands, fires were routinely suppressed to prevent their spread to inhabited areas. Now scientists and park managers employ prescribed burns, which are controlled and localized so that the pines get the fire they depend on and there is low risk of the fire escaping and accidentally destroying homes. When fire is suppressed, it becomes easier for exotic species to take over. Exotic plants, such as Brazilian pepper, tend to push out native species.

Mangroves

- **General Description:** Most plants cannot grow in salt water, but mangrove trees are well adapted to salt (salt tolerant). Mangroves are found along tropical and subtropical coasts in flooded saltwater areas. Mangroves provide the shoreline with protection from wind, waves and floods.

Introduction

- **Wildlife:** Three species of mangroves are found in Florida; the red, black and white mangroves. Usually, red mangroves grow along the water's edge, black mangroves grow slightly farther from the water's edge than the red mangrove and white mangroves grow inland from the red and black. Buttonwood, which is also salt tolerant, is usually found growing with the white mangrove. Mangroves provide protection, and therefore are good breeding grounds and nursery areas for many terrestrial and marine animals including juvenile fish, invertebrates, amphibians, reptiles, birds and mammals. There are two main reasons that these animals like to use mangroves. First, mangrove leaves, trunks and branches fall into the water and are transformed into detritus. Mangrove detritus is an important food source. Second, the root systems, fallen branches and shading provided by overhead foliage reduce the risk of predation on young animals. Without mangroves, many fish and other animals would not survive to adulthood.
- **Major Threats:** The most pressing threat to mangrove habitats is coastal development. Coastal areas are prime real estate, and many developers in the past have destroyed large tracts of mangroves to build condos or houses. Early settlers found mangrove habitats to be unpleasant, mosquito infested and even smelly (the rotting detritus can produce a distinctive sulfur odor), however we now know that mangroves perform very important ecosystem functions as nurseries for young fish and shoreline protection. Mangrove ecosystems are protected by law from cutting or trimming.

Hardwood Hammocks

- **General Description:** Hardwood hammocks are localized, thick stands of hardwood trees that can grow on natural rises of only a few inches in elevation. In South Florida, hammocks occur within marshes, pinelands and mangrove swamps. Hammocks rarely flood because of their slight elevation. Woodland or pine rockland that is not logged or burned for more than 20 years will develop into a hammock. Close to 80% of the hardwood hammock habitat has been destroyed in South Florida.
- **Wildlife:** Hammocks may contain trees of temperate climate origin like red maple and live oak, and of tropical climate origin such as the sabal palm, cabbage palm, mahogany, gumbo limbo and cocoplum. The diverse flora found in hammocks also includes many additional tree species, epiphytes (air plants), and ferns. More epiphytes are found in South Florida hammocks than in any other type of forest in the United States. The plants of the hardwood hammocks provide critical foraging and nesting habitat for some highly endangered animal species including the Florida tree snail and the Schaus swallowtail butterfly. Both of these are found only in hardwood hammocks of South Florida. Other wildlife found include raccoons, opossums, birds, snakes, lizards, tree frogs, and large endangered animals such as the Florida panther, bobcats and Key deer.
- **Major Threats:** Hammocks that grow on high ground have long been considered ideal home sites because they are well drained, shaded, and beautiful. Consequently, most of Florida's upland hammocks have been destroyed by development. Those that remain occur in a few state and national parks.

Vocabulary

Acre: 43,560 square feet

Detritus: loose material (such as rock fragments or organic particles) that results directly from disintegration.

Ecological Role: the role that an organism provides in its habitat.

Ecosystem: a biological community consisting of all the living (biotic) organisms in an area and the non-living (abiotic) components of the environment that they interact with.

Endemic: a species that is not found anywhere else in the world.

Epiphyte: a plant that grows above the ground, supported by another plant or object, and derives its nutrients and water from rain, the air, dust, etc.

Germination: the process by which a seed begins to develop into a plant.

Habitat: the natural home or environment of an animal, plant, or other organism.

Herbaceous: a plant or part of a plant that is fleshy and does not have a permanent woody stem.

Invasive: a non-native species likely to cause economic or environmental harm.

Native: a term to describe plants endemic (indigenous) or naturalized to a given area.

Shrub: a woody perennial plant usually less than 20 feet tall and often with several woody stems rather than a single trunk.

Species: organisms capable of interbreeding.

Tree: a woody perennial (living for multiple years) plant, typically having a single trunk growing to a considerable height and bearing lateral branches at some distance from the ground.

Pine Rockland Activities

Pine Rockland Ecosystem Investigation

Supplies to use in this ecosystem:

- *Investigating Ecosystems Worksheets*
 - Sensory Observations
 - Soil Observations
- Laminated *Pine Rockland Plants ID guides*
- *Meet a Native* worksheet
- Laminated *Identifying Native Plants* dichotomous key (optional)

1. As a group, read the pine rockland habitat description in the introduction.
2. In small groups, complete the *Investigating Ecosystems* worksheets.
3. Walk through the pine rockland ecosystem and locate examples of the plants on the *Pine Rockland Plants ID guides*. As you observe the various plants, fill in information about each plant on the *Meet a Native* worksheet.
4. Using the following examples, discuss the importance of fire in pine rocklands and the adaptations that pine rockland plants have to help them survive fires:
 - o Plants in this ecosystem have deep underground roots. How might this help them to survive?
 - o Slash pines have thick bark. Why might this be advantageous?
 - o Saw palmetto roots and leaves regenerate easily and quickly. Why is this important?
 - o Dormant seeds need fire to germinate. What might happen in the absence of fire?
5. Let students touch, smell and observe. Let them have independent time in to explore each area.

Optional activity: Use the laminated *Identifying Native Plants* dichotomous key to identify plant species in the pine rockland ecosystem.

Mangrove Activities

Mangrove Ecosystem Investigation

Supplies to use in this ecosystem:

- *Investigating Ecosystems Worksheets*
 - Sensory Observations
 - Soil Observations
- Laminated *Mangrove Plants ID guides*
- *Meet a Native* worksheet

1. As a group, read the mangrove habitat description in the introduction.
2. In small groups, complete the *Investigating Ecosystems* worksheets.
3. Walk through the mangrove ecosystem and locate examples of the plants on the laminated *Mangrove Plants ID guides*. As you observe the various plants, fill in information about each plant on the *Meet a Native* worksheet.
4. Using the following examples, discuss the unique features and ecological role of the mangrove ecosystem.
 - o Mangroves have particular adaptations to help them live successfully under harsh environmental conditions. Red mangroves have aerial prop roots that hang down, while black mangroves have specialized structures called pneumatophores which grow from underwater. How might these specialized structures help mangroves thrive in an aquatic environment?
 - o Why are mangrove ecosystems important? What are some of the ecosystem services they provide?
 - o What are some of the main threats to mangroves? What can you do to prevent them?
5. Let students touch, smell and observe. Let them have independent time in to explore each area.

Hardwood Hammock Activities

Hardwood Hammock Ecosystem Investigation

Supplies to use in this ecosystem:

- *Investigating Ecosystems* worksheets
 - Sensory Observations
 - Soil Observations
- Laminated *Hardwood Hammock Plants ID guides*
- *Meet a Native* worksheet
- Laminated *Identifying Native Plants* dichotomous key (optional)

1. As a group, read the hardwood hammock habitat description in the introduction.
2. In small groups, complete the *Investigating Ecosystems* worksheets.
3. Walk through the hardwood hammock ecosystem and locate examples of the plants on the laminated *Hardwood Hammock ID guides*. As you observe the various plants, fill in information about each plant on the *Meet a Native* worksheet.
4. Compare a hardwood hammock ecosystem to a pine rockland or mangrove ecosystem, using the following examples:
 - o Observe the root structures of trees in the hardwood hammock. Think back to the root structures of mangroves. What are the differences between the root structures of hardwood hammock trees and mangroves? Why do you think they are different?
 - o Why might a hardwood hammock have fewer understory species growing on the ground than a pine rockland?
 - o Why might a hardwood hammock support the growth of more epiphytes such as orchids, bromeliads, or ferns than a pine rockland ecosystem?
5. Let students touch, smell and observe. Let them have independent time in to explore each area.

Optional activity: Use the laminated *Identifying Native Plants* dichotomous key to identify plant species in the pine rockland ecosystem.

Conclusion

Now that you have explored Fairchild's mangrove, pine rockland and hammock ecosystems, answer the following questions as a group:

- What are the most dominant plant species or plant types in each ecosystem?
- What are some of the most important animal species or animal types? How are these animals dependent on the plants?
- Why are the plants crucial in this ecosystem (why the ecosystem could not function without the plants)?
- What are the biggest threats to each ecosystem? List the major threats and discuss them. Come up with one or two possible solutions to the problem.
- What are some other interesting facts that you did not know about each ecosystem?

Thank you for coming to Fairchild Tropical Botanic Garden! We hope that you enjoyed your visit and that you will come back to keep exploring and learning about tropical plants.

Before you leave, please remember to put all materials inside the backpack, fill out the survey, and return the backpack to the Visitor Center.

FAIRCHILD TROPICAL BOTANIC GARDEN

Exploring, Explaining and Conserving the World of Tropical Plants

INVESTIGATING ECOSYSTEMS

The ecosystem I am in is: _____

SENSORY OBSERVATIONS

Look around you. Use the questions below to describe this ecosystem.

What sounds do you hear?	How much of the sky can you see when you look up?
Is it hot, warm, or cool?	Is it bright, shady, or dark?
What does it smell like?	What animals (including insects) do you think would like to live here?

Something else I observed about this ecosystem is:

LIVING AND NON-LIVING TOGETHER

An ecosystem contains both living and non-living elements. List 2 living and 2 non-living components of this ecosystem.

LIVING	NON-LIVING
1)	1)
2)	2)

Look for evidence of animals, including humans. Write down what you see.

INVESTIGATING ECOSYSTEMS

The ecosystem I am in is: _____

SOIL OBSERVATIONS

Use the questions below to describe the soil.

Is the soil moist or dry?	Does the soil have leaves or other organic matter in it? How much?
What color is the soil?	Does the soil have rocks in it? If so, are they small, medium or large? Are there a few rocks or many?
Does the soil have bugs or other living things in it?	Feel the texture of the soil – does it feel like clay or sand?

Something else I observed about this soil is:

Meet a Native!

For each of the native plants listed, fill out the table below. Draw a leaf in the 1st column. Describe each part of the plant in the columns provided (shape, size, color, smell, etc.). Add any other details you want. If you don't see flowers or fruits on the plant you find in the Garden, you can fill in the information later, using books or the Internet. Notes might describe animals that depend on the plants or important human uses.

Pine Rockland					
<i>Callicarpa americana</i> Beauty Berry	Leaf	Trunk	Flowers	Fruits	Characteristic to remember
<i>Pinus elliotii</i> Dade County Slash Pine	Leaf	Trunk	Flowers	Fruits	Characteristic to remember
<i>Serenoa repens</i> Saw Palmetto	Leaf	Trunk	Flowers	Fruits	Characteristic to remember

Pine Rockland

Zamia integrifolia
Coontie

Leaf

Trunk

Flowers

Fruits

Characteristic to remember

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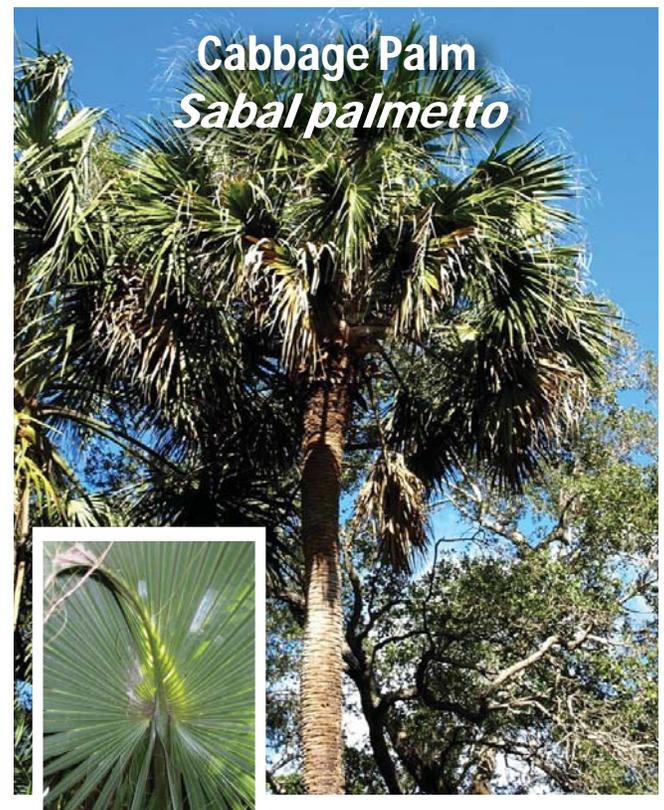
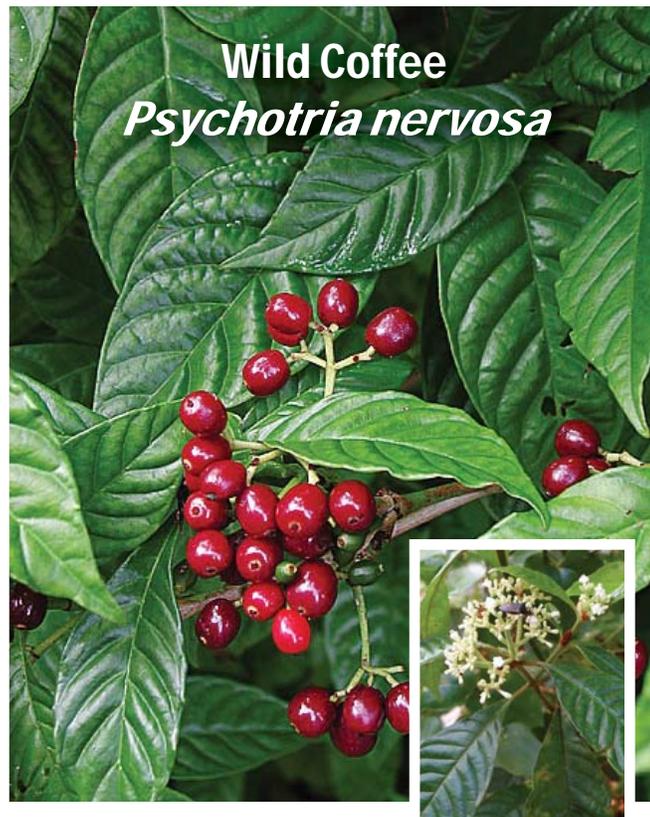
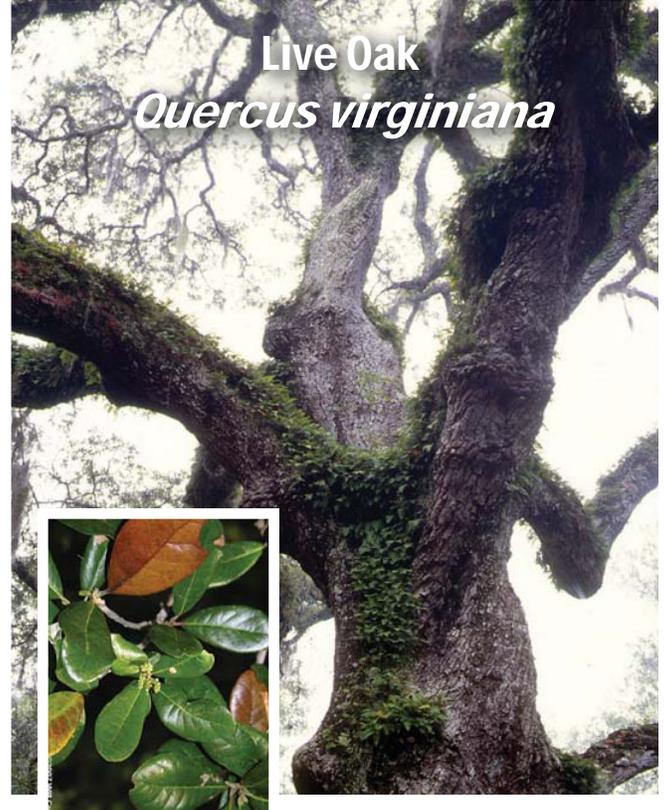
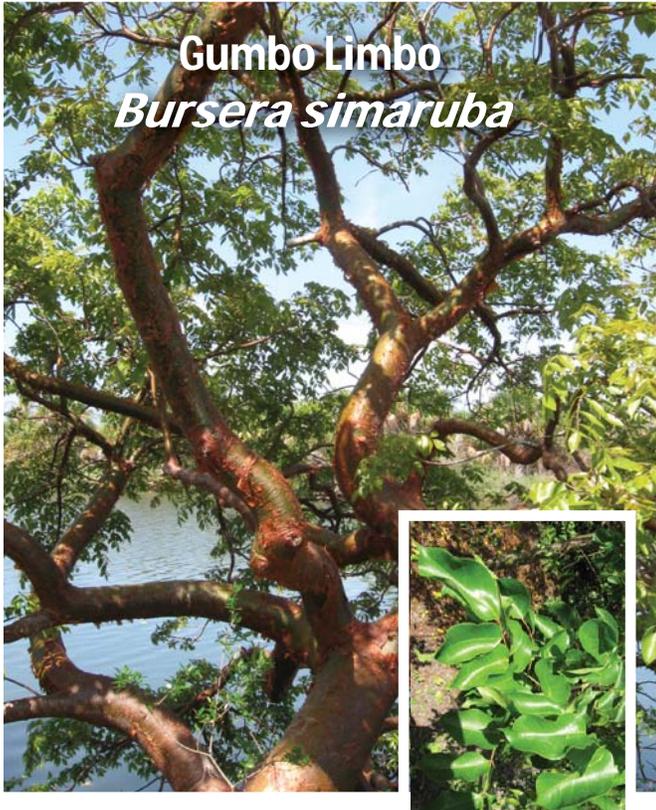
Mangrove

<i>Avicennia germinans</i> <i>Black Mangrove</i>	Leaf	Trunk	Flowers	Fruits	Characteristic to remember
<i>Conocarpus erectus</i> <i>Buttonwood</i>	Leaf	Trunk	Flowers	Fruits	Characteristic to remember
<i>Laguncularia racemosa</i> <i>White Mangrove</i>	Leaf	Trunk	Flowers	Fruits	Characteristic to remember
<i>Rhizophora mangle</i> <i>Red Mangrove</i>	Leaf	Trunk	Flowers	Fruits	Characteristic to remember

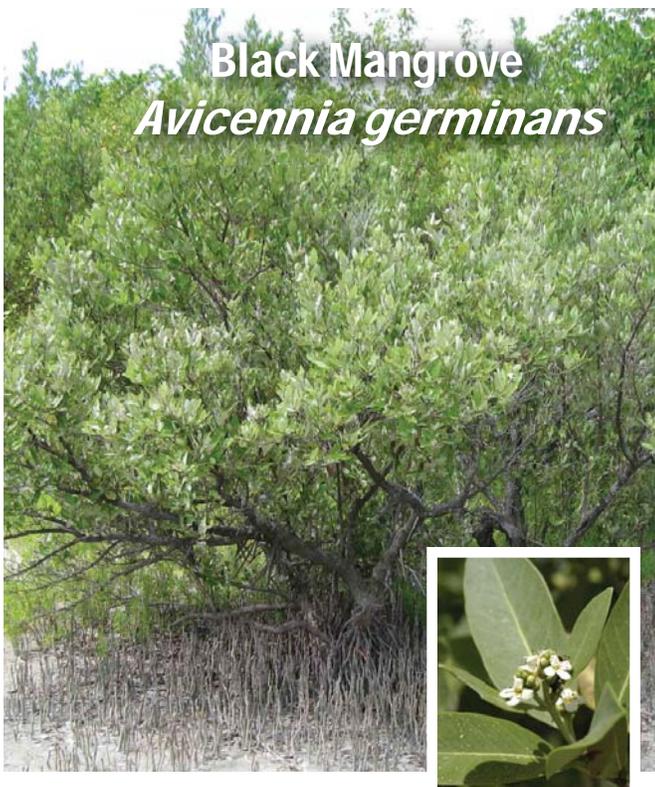
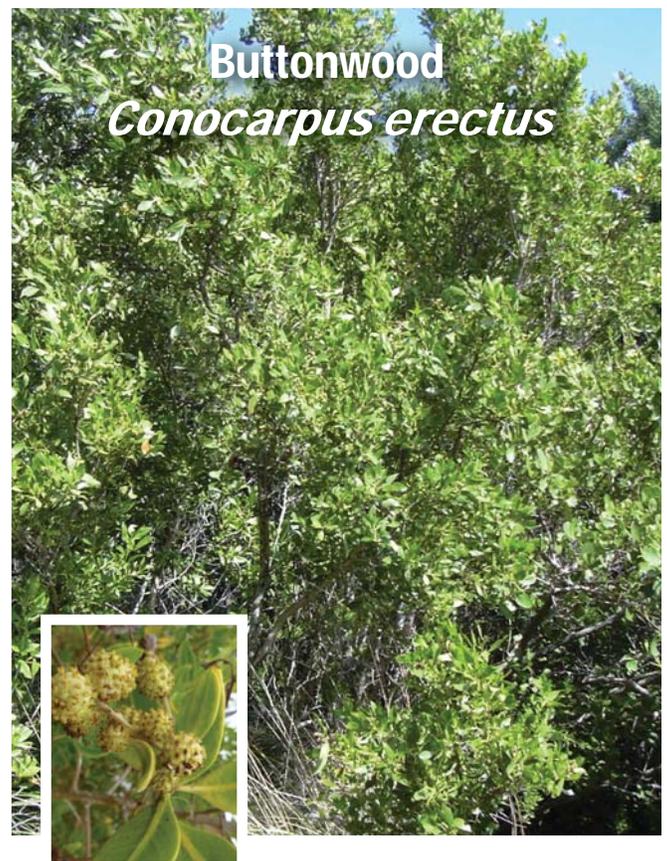
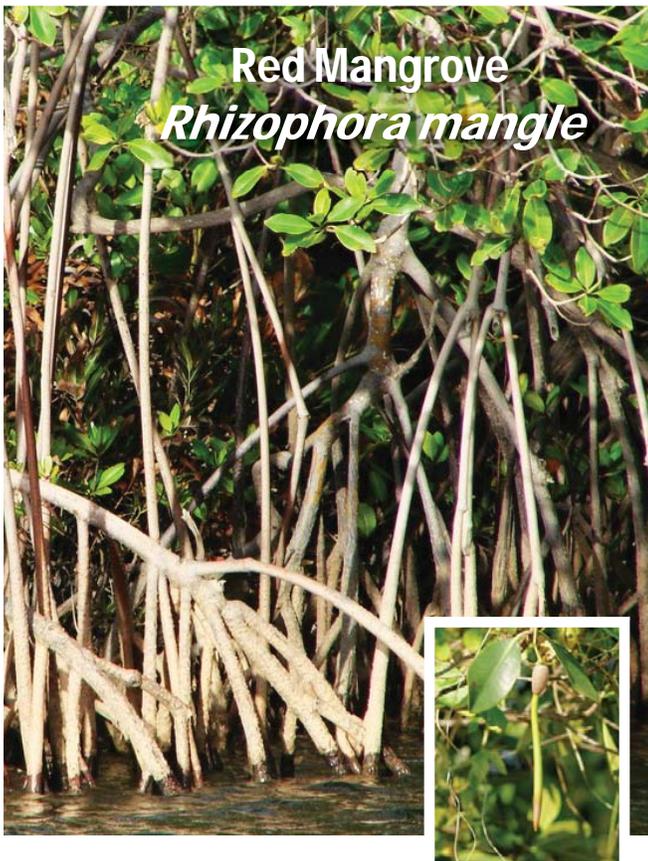
Hardwood Hammock

<i>Bursera simaruba</i> Gumbo Limbo	Leaf	Trunk	Flowers	Fruits	Characteristic to remember
<i>Psychotria nervosa</i> Wild Coffee	Leaf	Trunk	Flowers	Fruits	Characteristic to remember
<i>Quercus virginiana</i> Live Oak	Leaf	Trunk	Flowers	Fruits	Characteristic to remember
<i>Sabal palmetto</i> Sabal or Cabbage Palm	Leaf	Trunk	Flowers	Fruits	Characteristic to remember

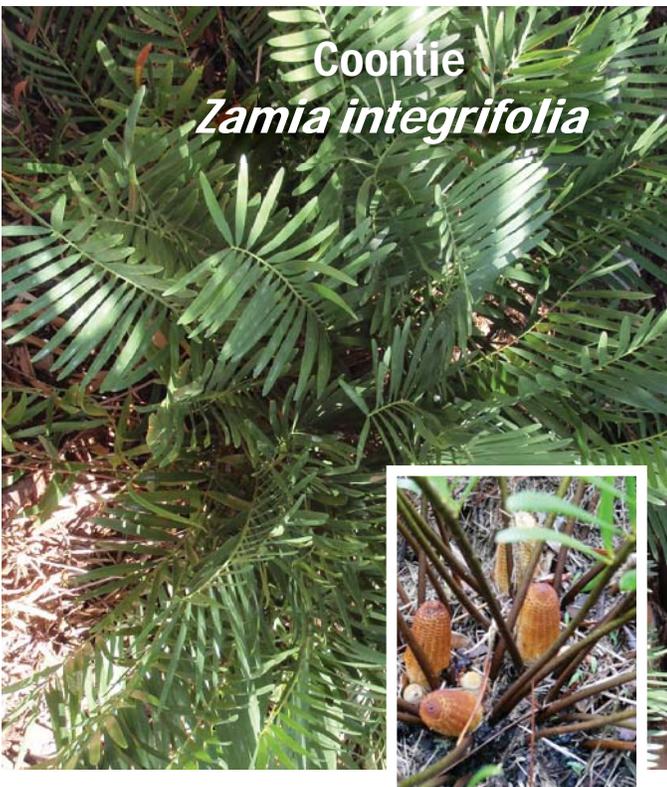
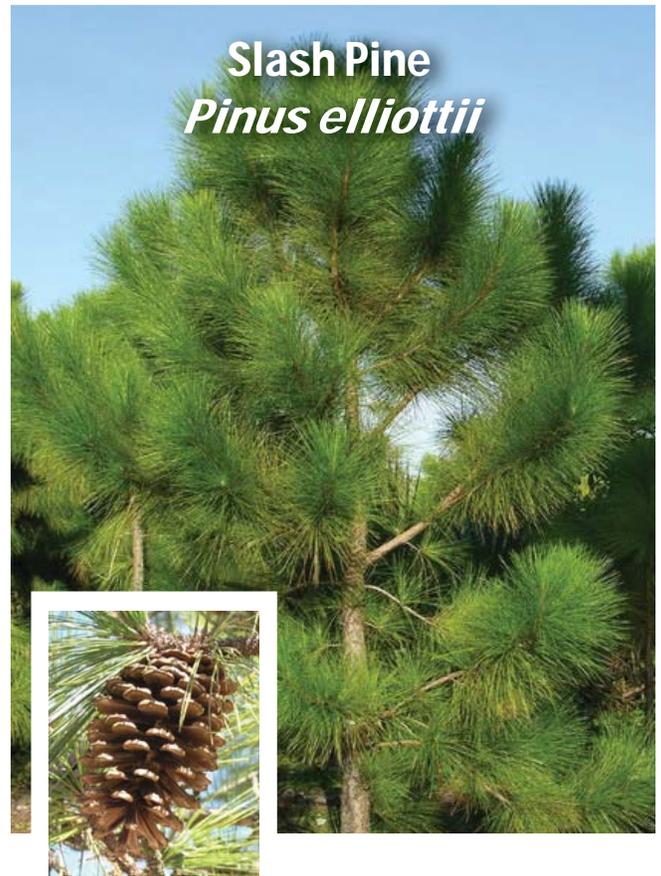
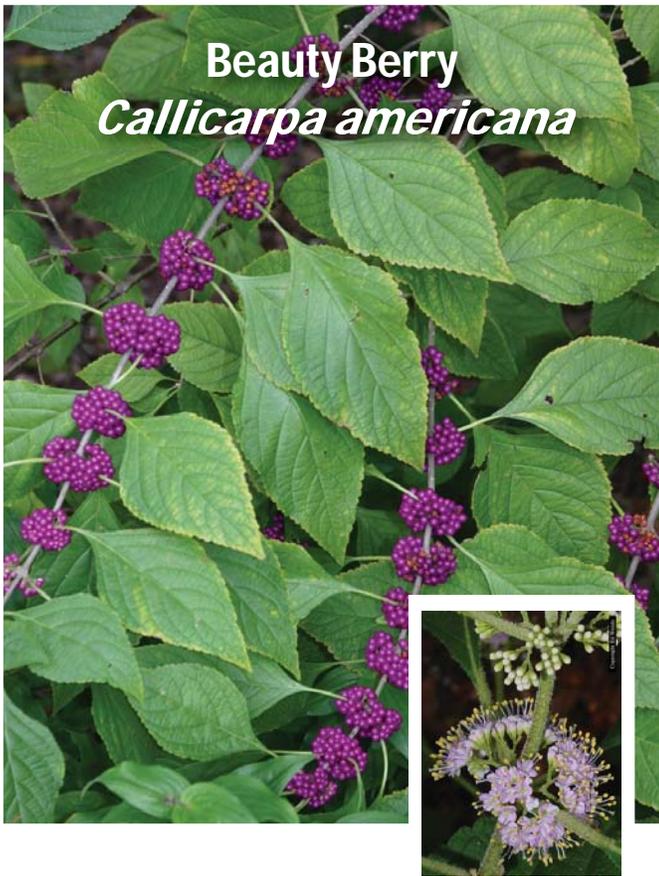
Hardwood Hammock Plants



Mangrove Plants



Pine Rockland Plants





Our mission is to save tropical plant diversity by exploring, explaining and conserving the world of tropical plants; fundamental to this task is inspiring a greater knowledge and love for plants and gardening so that all can enjoy the beauty and bounty of the tropical world.



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