



ECOLOGICAL CORRIDORS



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 to use the Garden Cafe, Gift Shop or 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:

- Pine Rockland booklets - 3

Great Migration Challenge

- *The Great Migration Challenge Activity Cards* - 10
- Bird cards - 10
- *Pine Rockland Worksheets* - 10
- Dice - 10

Resource Relay

- Straws - 30
- Paper cups - 3
- Bottle of water -1
- Marker flags - 6

Drawing

- Paper
- Colored pencils
- Pencil sharpeners -2

Get Started

1. Review the Ecological Corridors Introduction, Vocabulary and Activities included in the backpack.
2. Using the map, walk as a group to the Pine Rockland.
3. While there, complete the 3 activities and corresponding worksheets.

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:

- Students learn ecological concepts such as ecological corridors, habitat fragmentation and migration.
- Students become familiar with pine rocklands ecosystems and some of the plants found there.
- Students experience some of the challenges birds face during migration.
- Students understand the importance of plants and the various roles they have in an ecosystem.

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

What is Habitat Fragmentation?

In South Florida, and most other heavily urbanized areas of the globe, the pressures associated with development and population growth can nearly exhaust the region's green spaces. In such cases, a predominantly urbanized zone's remaining natural spaces can function as "islands" of resources and provide limited habitat for local flora and fauna. In Miami, for example, varieties of birds and butterflies reside in a patchwork of green spaces scattered throughout the city.

It is often necessary for some of these species to periodically move among these green spaces in search of food, shelter and other essential resources. When the gaps between these green spaces become numerous and wide enough to hinder the movement of local wildlife populations between habitats, we would consider that region's habitats to be fragmented. Habitat fragmentation can have severely detrimental effects on a region's biodiversity by limiting the range of flora and fauna, and by causing the partial or complete disappearance of certain species when they are unable to find sufficient habitat for food and shelter.

What is an Ecological Corridor?

Sometimes fragmented ecosystems are connected by small areas of habitat which allow for some species to move between them. These areas act as "bridges" between patches of habitat and are referred to as ecological corridors. An ecological corridor enables population exchange between ecosystems and can help bolster that region's biodiversity. Recently, humans have begun to create or restore ecological corridors. Ecological corridors come in many other forms, for example: planting native plants and trees in your yard could provide an extra stepping stone or stopover along a corridor used by birds and butterflies.

One of the first attempts at restoring an ecological corridor took place on a golf course in 2001 in Jasper National Park in Alberta, Canada. In this case, the golf course was fenced off creating an impassible barrier. The course, originally built on traditional wolf territory, had effectively blocked the wolves' migratory path, leading to their disappearance from the area. When a carefully planned wooded corridor was introduced through the golf course, wolves once again began to use the corridor and a measurable population improvement was documented.

Vocabulary

Biodiversity: the variety of life on earth or in a particular habitat or ecosystem, or the number of species in a given area.

Ecological Corridor: flight or travel routes used by migratory birds and other animals between their feeding grounds and their breeding grounds.

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 Species: only found in a specific region and nowhere else in the world.

Energy: a source of exertion of heat or power.

Exotic Species: a species introduced into an area where they do not occur naturally.

Fauna: all of the animal life of a given region or period considered as a whole.

Flora: all of the plant life of a given region or period considered as a whole.

Habitat: a place where animals, plants and humans are found.

Habitat Fragmentation: the division of large continuous tracts of habitat into smaller areas.

Migration: movement of a species from one place to another; often following a change of season.

Migratory Animals: animals that move from one place to another during seasonal change.

Native Species: the presence of a species in a region is the result of only natural processes, with no human intervention.

Population Growth: the change in a population over time.

Threatened Species: a species whose population is so small or is declining so rapidly that it may become endangered in all or a significant portion of its range.

Species: organisms capable of interbreeding.

Nest: shelter prepared by birds for their eggs and young.

Stopover: a brief stay during the course of migration.

Urbanization: a process closely related to industrialization, where an increasing proportion of the population lives in cities and suburbs.

Pine Rockland Ecosystem



General Description

Pine rocklands are found on limestone bedrock on the Miami Rock Ridge and in the Florida Keys. The pine rockland 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. The 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.

Plants

Pine rocklands are dominated by one species of pine tree, the South Florida Slash pine, also called Dade County 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 such as the crenulate leadplant, deltoid spurge and Small's milkwort are found here.

Animals

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.

Activities

Are you ready to explore the Garden while learning about ecological corridors and habitat fragmentation? In this packet, you will find a variety of activities and guides to help you learn and explore. Now go and have fun!

Procedure

- Explain to students that they will be investigating a Pine Rockland ecosystem.
- Use the Garden map to help you navigate to the Pine Rockland ecosystem.
- Have the students work in pairs.
- Distribute worksheets, guides and pencils to each pair.
- Give students time to walk through the pine rockland and complete their worksheets.
- Ask each group to share highlights of what they found.

Activity I. The Great Migration Challenge at the Pine Rockland

Adapted from Flying Wild: The Great Migration Challenge Activity

Background

Each year in North America nearly 350 different species of birds migrate, or move from one place to another. Migration can best be understood as an annual movement from one area to another and the eventual return to a particular breeding area. Most migrations results from seasonal changes that lead birds and other animals (such as butterflies, bats, caribous and whales) to move to areas where the food supply is more abundant, climates are warmer and more favorable for survival, and hours of sunlight are longer.

Some species of birds move only a short distance within their geographical area. Other species travel thousands of miles, crossing oceans and, in some cases, continents during their annual migratory journeys. Migrating long distances requires a tremendous amount of energy. Before a major migratory trip, birds accumulate a reserve of fat to fuel their journey. They need food and clean water to nourish them along their way-they also need a clean environment. Alteration or loss of habitats along their migratory paths and breeding and wintering grounds pose serious challenges. Many other hazards facing migratory bird populations include collisions with skyscrapers, windows, radio and communication towers, and predators, including cats. Exposure to pesticides, such as DDT, and diseases, such as the West Nile Virus, have had devastating effects on many birds populations.

As scientists continue to study and learn more about migratory birds-why birds migrate, where they migrate, and the many challenges they face along their journeys-it becomes clear that birds' survival is in great part dependent on *human* actions. Thanks to the hard work of many dedicated individuals, resource agencies, and environmental groups, more people are taking action to ease the plight of migratory birds. Understanding more about migratory birds and their conservation needs is the first step in helping them survive. The actions you take to help them along in their journeys can and will make a difference.

The Great Migration Challenge at the Pine Rockland

Materials

- *The Great Migration Challenge Activity Cards* - 10
- Bird cards - 10
- *Pine rockland Worksheets* - 10
- Dice - 10

Procedure

In this activity you will explore the hazards and helpers that migratory animals encounter on their long-distance journeys. A series of numbered signs are placed throughout the pine rockland exhibit. Begin by choosing the bird you will be on your migratory journey from the set of bird cards.

- Divide students into groups of 2-4 individuals. Distribute one set of *The Great Migration Challenge Activity Cards*, and a die to each group.
- Each group should start at Station 1, found by locating the numbered sign near the entrance to the pine rockland exhibit. Next, each group rolls a die and moves ahead to the station with the same number on the die.
- At each station, students should follow the instructions on *The Great Migration Challenge Activity Cards* that matches the number of the station they are at, and answer the corresponding numbered question on the *Pine Rockland Worksheet*.
- When conditions are favorable, the card tells you to move ahead. When you encounter a hazard, you may be delayed or have to go back.
- Groups continue to roll die at each station, answer questions, and move forward, or sometimes backwards, until they either reach their feeding grounds or perish during the journey.
- REMEMBER! Not all birds survive migration. Some live, and some die. Use this opportunity to discuss how humans can create more favorable and safe conditions for migratory animals.
- The data recorded can become the basis for their discussions and other activities. At the end, allow time for students to share highlights of what they found.
- Additional activity: students can learn more about pine rocklands. Use the Pine Rockland Ecosystem sheet for more detailed information.

Pine Rockland Worksheet

Journey through the Pine Rockland to find the stations for your migration.
Observe the plant and read the sign carefully to answer the following questions.

Station Number	Station Name	Question	Answer
1	Pine Rockland Ecosystem	What species of pine is found in this ecosystem?	
2	Lignum vitae/ <i>Guaiaecum sanctum</i>	Is this plant a host or nectar plant?	
3	Quailberry/ <i>Crossopetalum illicifolium</i>	What animals like to eat the red fruit of this plant?	
4	Beauty berry/ <i>Callicarpa americana</i>	What ecosystem service does this plant provide for wildlife?	
5	East coast lantana/ <i>Lantana depressa</i>	This plant can be easily mistaken with which plant?	
6	Pineland croton/ <i>Croton linearis</i>	This plant is the only host plant for which butterfly?	
7	Pineland strongbark/ <i>Bourreria cassinifolia</i>	What attracts pollinators to this plant?	
8	Cabbage palm/ <i>Sabal palmetto</i>	Pollinators are attracted to what part of this plant?	
9	Florida privet/ <i>Forestiera segregata</i>	What color is the fruit of this plant?	
10	Pineland acacia/ <i>Acacia pinetorum</i>	This plant is the primary host plant for which butterfly?	
11	Slash pine/ <i>Pinus eliotii</i>	Animals like to eat which part of this plant?	
12	Silver palm/ <i>Coccothrinax argentata</i>	This plant is a host for which butterfly?	
13	Saw palmetto/ <i>Serenoa repens</i>	This plant is a native source for which pollinator?	

Pine Rockland Worksheet

Station Number	Station Name	Question	Answer
14	Fire	Why is fire important in pine rocklands?	
15	Habitat for endangered or threatened animals	Can you name three animals that live in pine rocklands?	
16	Biodiversity	Which part of this ecosystem is the most biodiverse?	
17	Mexican alvaradoa/ <i>Alvaradoa amorphoides</i>	This plant is a host plant for which butterfly?	
18	Teabush/ <i>Melochia tormentosa</i>	This plant is a nectar source for which pollinator?	
19	Dwarf Fakahatchee grass/ <i>Tripsacum floridanum</i>	Is this plant commonly found in the wild?	
20	Indigo berry/ <i>Randia aculeata</i>	Humans can use this plant to make what product?	
21	Hawk Zone	What species of hawks are seen at Fairchild?	
22	Coontie/ <i>Zamia integrifolia</i>	What part of this plant can you use to make bread?	
23	Rough velvet seed/ <i>Guettarda scabra</i>	Which part of this plant is fragrant?	
24	Pineland snowberry/ <i>Chiococca parvifolia</i>	This plant is a nectar plant for which pollinator?	

Resource Relay

Activity II. Resource Relay

One of the primary motivators for wildlife to follow an ecological corridor is the need for food. Nesting birds with young to feed spend the majority of their time on the hunt to feed their little ones. Let's see who can get the most "food" back to the nest!

Resource Relay

- Straws - 30
- Paper cups - 3
- Bottle of water - 1
- Marker flags - 6

Procedure:

The distance a bird must fly when retrieving food for their brood usually varies depending on several factors such as weather, type of food source, degree of human development in the area, etc. In this relay game, participants will have to traverse 1 of 3 different distances, each representing a different food source, and compare amounts of food gathered based on distance travelled.

- Use the marker flags to designate a start and finish line for 3 courses (spaced roughly 20, 30 and 40 ft apart, depending on how challenging you want to make it).
- Place the pre-marked cup corresponding with the course's length (short, med., and long) at each finish line.
- Divide the students in 3 groups of equal size, and assign each group to one of the three course distances.
- Students will submerge their straws into the bottle of water and, using their finger tip, keep the straw filled and run as fast as they can to fill the cup at the finish line.
- Students will be given 5 minutes to run in a relay style back-and-forth. Students may run more than once after everyone in their team has ran once.
- Observe who can replenish their course's food supply the fastest by comparing the cups from each course and seeing which one has the highest volume of food!
- Have a discussion with your group using the following questions as a guide:
Which group had the most food? Why? Which group has the least food? Why?
If your group migrated the least distance searching for food, what did you observe?
If your group migrated the most distance, what did you observe?
How much energy do you think a bird needs to migrate from one area to another?

Drawing Activity

Materials

- Paper
- Colored pencils
- Pencil sharpeners -2

Procedure

Migrating through the pine rockland area can be exhausting! It's now time for a stopover in your favorite place in the pine rockland area. As you learned about migration and looked for food, did you find interesting plants? Choose a plant of special interest to you in the pine rockland and use it as the focus of your art piece. Focus on a single species and practice careful observation. Don't worry, you do not need to be an artist to do this activity. Enjoy the scenery, touch, smell and observe all the different details about your plant. Try to be precise and creative with your drawing. What does the texture feel like? Does it have any flowers? If it does, what does it smell like? What shape are the leaves? What color are the bark, leaves, branches, flowers, fruits and/or seeds? Do you notice any patterns in the leaf arrangements, the branching of the plant? Is your plant small or big?

Please do not take any parts of the plants away, so that other visitors may enjoy this plant just like you did!

Program Conclusion

You have now learned about habitat fragmentation and what ecological corridors are. Think about all the activities you did and all the places you visited at the Garden today to answer the following questions:

- What do you think are some of the main causes of habitat fragmentation?
- What can we do to prevent it?
- What are ecological corridors? Why are they important?
- Can you name two plants in the pine rockland that provide habitat or food for wildlife?

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 back all the materials inside the backpack, fill out the survey and return the backpack to the Visitor Center.

Pine Rockland Plants

Pine Rockland Ecosystem



Venture into our region's marshes, pinelands swamps and you might find thick stands of cypripedium growing on natural rises, only a few inches high. These are the hardwood hammocks, rare and home to many native plant species such as palmetto, gumbo limbo and cabbage palm. Other plants of air plants, known as epiphytes. You may also find across the pine rocklands, a fire-dependent ecosystem maintained by controlled burning. Here, you'll find over a savanna-like understory of saw palmetto, grasses and endangered species like the Florida Small's milkwort. Hurry though, because these ecosystems are quickly disappearing.

FAIRCHILD TROPICAL BOTANICAL GARDEN
EXPLORING, EXPLAINING AND CONSERVING



Lignum vitae
Guaiacum sanctum



Quailberry
Crossopetalum illicifolium



Beauty berry
Callicarpa americana

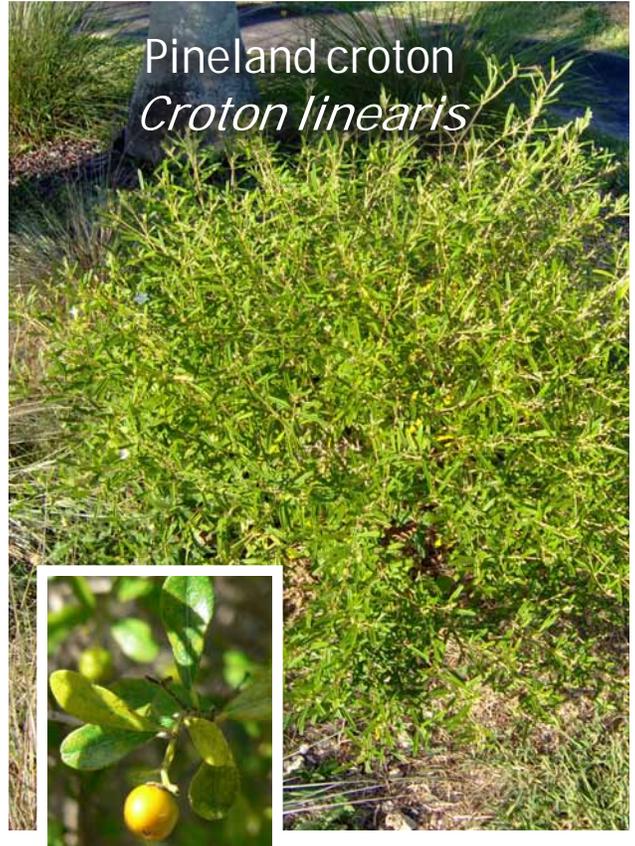


Pine Rockland Plants

East coast lantana
Lantana depressa



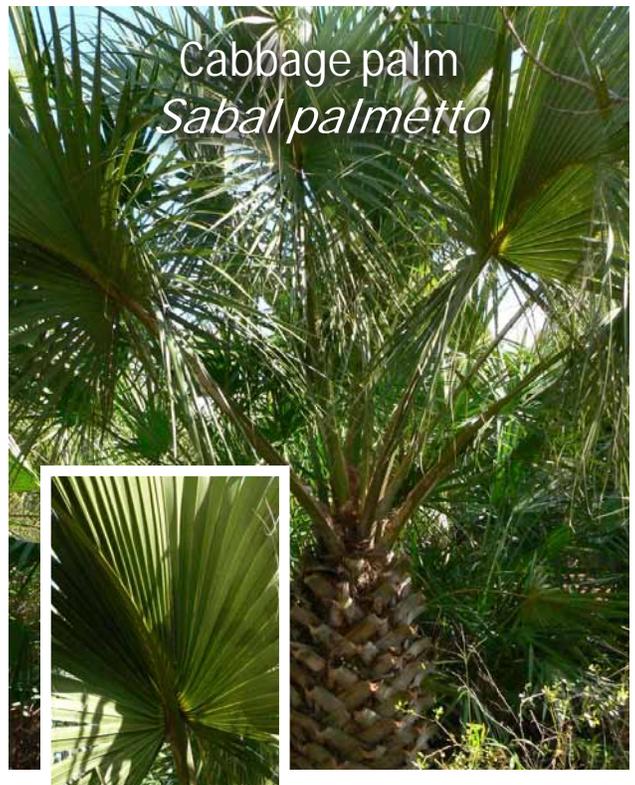
Pineland croton
Croton linearis



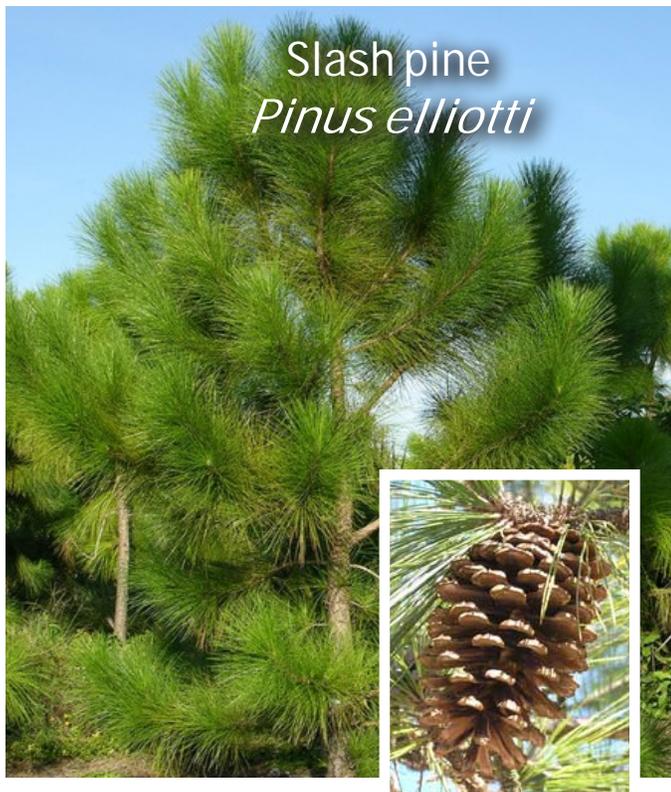
Pineland strongbark
Boufferreria cassinifolia



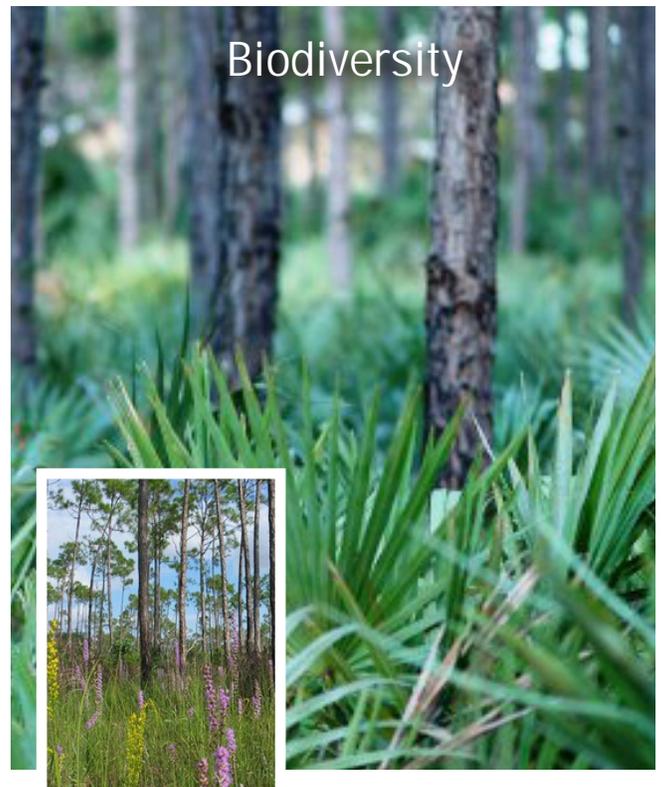
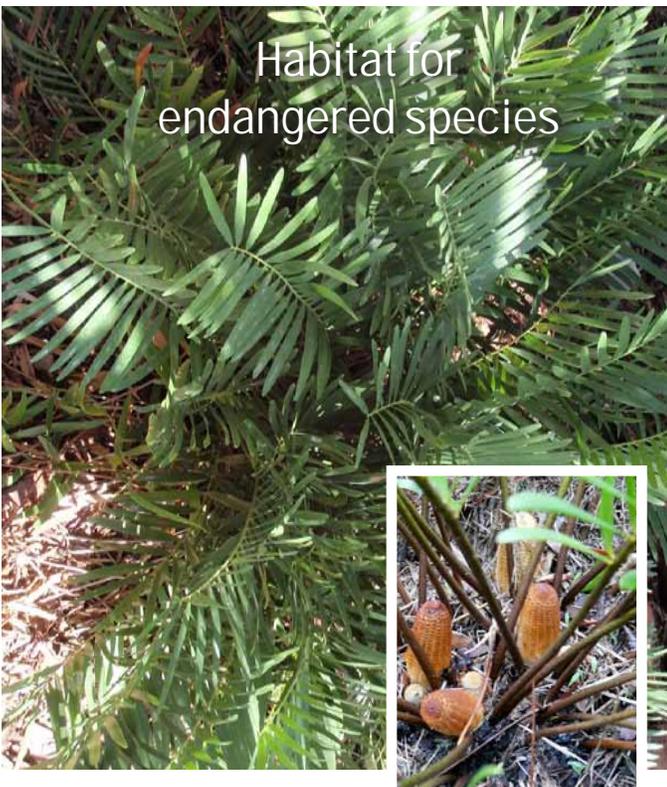
Cabbage palm
Sabal palmetto



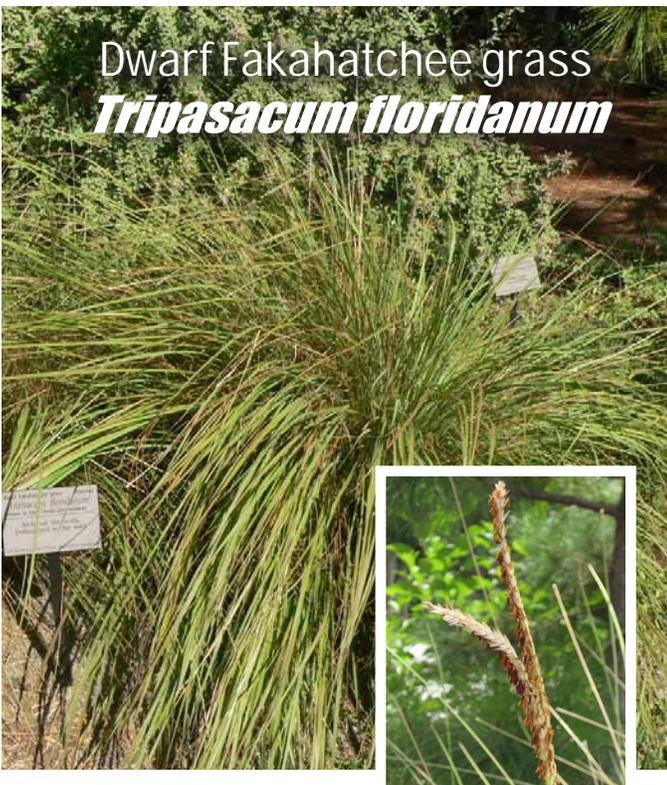
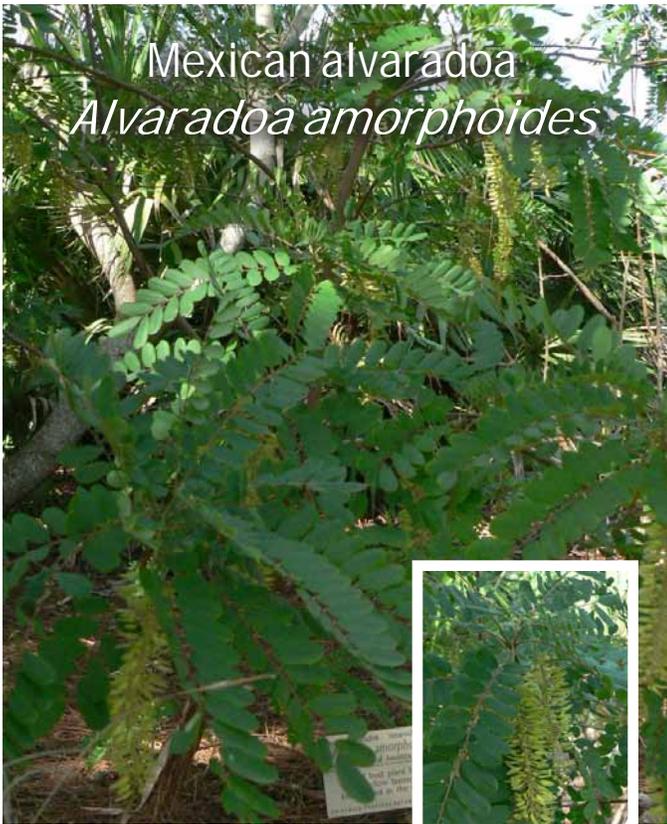
Pine Rockland Plants



Pine Rockland Plants



Pine Rockland Plants



Pine Rockland Plants

Hawk Zone



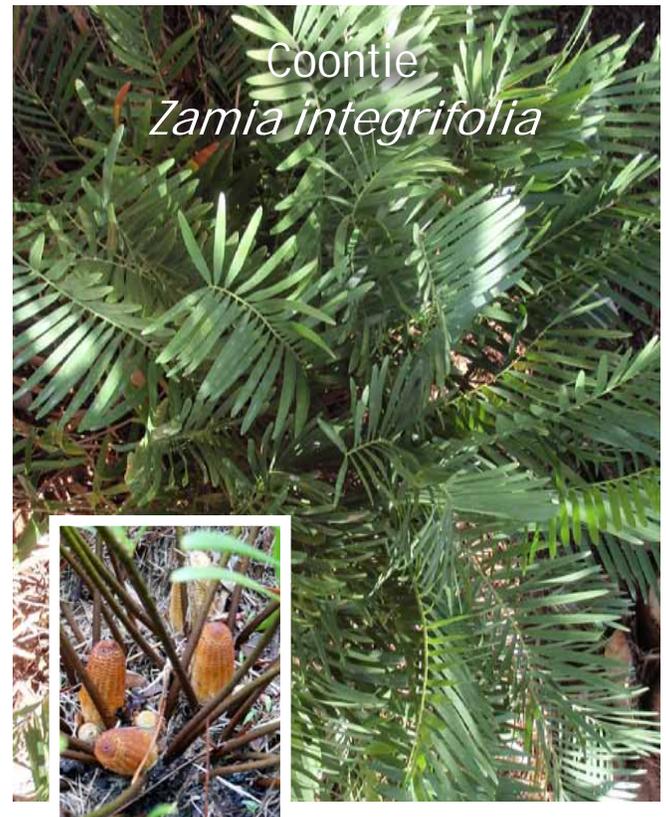
Red shouldered Hawk

THE JAMES A. KUSHLAN BIR

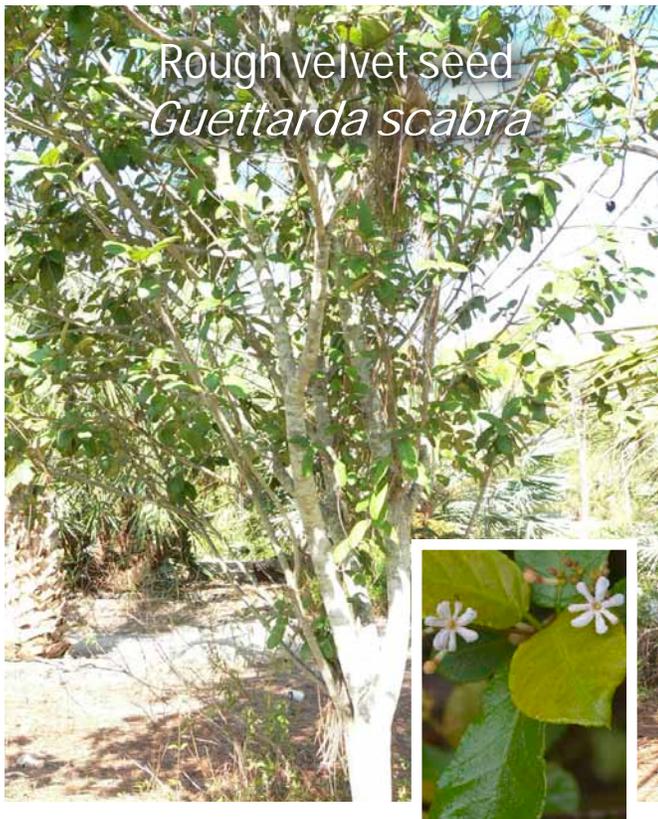
Hawk Zone

Raptors are frequently seen at Fairchild, both in the trees. Red-shouldered Hawks and Swallow hawks such as the Sharp-shinned Hawks and Broad-winged Hawks pass through the Garden. Short-tailed Hawk and American Kestrels occur primarily in winter. Turkey Vultures and Black Vultures can often be seen overhead on tall trees. Fish eating Osprey are seen at their platform or feeding in the lakes. Raptors face special conservation threats, especially those that migrate long distances. Pesticides, purposeful killing and habitat loss also impact these birds. For more information visit www.fairchildtropicalgarden.org/birds

FAIRCHILD TROPICAL GARDEN



Coontie
Zamia integrifolia



Rough velvet seed
Guettarda scabra



Pineland snowberry
Chiococca parvifolia





The Great Migration Challenge Activity Cards



<p>1</p> <p>Watch out! Power lines ahead. Don't hit them! Crawl ahead 5 feet. Then roll the die and move ahead the number of stations indicated.</p>	<p>2</p> <p>Good news! Food is plentiful. Many berries, seeds, grains, and insects are available in this overgrown field near a river. Smack your "beak" 10 times and move ahead 5 stations.</p>	<p>3</p> <p>Bad news. You land by a polluted marsh and become sick from the food you eat. Sit down, hold your stomach and count to 30. Groan 10 times. Then move ahead 1 station.</p>
<p>4</p> <p>Watch out for the predator—it wants to eat you! Freeze, count to 40, and then sneak ahead 2 stations.</p>	<p>5</p> <p>You escape capture by a predator, but slightly sprain your wing in the escape. Get it back in shape. Slowly swing your left arm around 10 times. Move ahead 1 station.</p>	<p>6</p> <p>Scientists catch you for research. They put a metal band on your leg and set you free. Tie a piece of flagging around your ankle. Move ahead 2 stations.</p>
<p>7</p> <p>You get tangled in fishing line and can't eat. You are weak from hunger. A wildlife rehabilitator cuts the line and feeds you. Hop on 1 leg in a circle, count to 40, then move ahead 4 stations.</p>	<p>8</p> <p>You land at a school where students created a schoolyard habitat. There is a bird feeder, you eat seeds, fruit, insects, and nectar. Peck or sip 20 times. Roll the die, then move ahead that number.</p>	<p>9</p> <p>It's raining, it's pouring, and you don't want to fly in this rainstorm. Count to 50 while you wait for the storm to stop, roll the die, then move ahead that number of stations.</p>
<p>10</p> <p>Strong winds from the wrong direction keep you from migrating. Roll the die and blow back that many stations.</p>	<p>11</p> <p>You can't find last year's resting spot because a new shopping mall has been built there. Walk around in 3 wide circles searching for rest and food. You are still hungry, and only have strength to move ahead 1 station.</p>	<p>12</p> <p>Whew! While flying near a large city, you almost collide with a jet. Go back 3 stations while you recover.</p>



The Great Migration Challenge Activity Cards



<p>13</p> <p>You arrive at a large lake, where there is plenty of clean water, food, and shelter. Rub your stomach 15 times and move ahead 4 stations.</p>	<p>14</p> <p>You are able to fly a long distance in one day, because of good winds. Roll the die and move ahead that number of stations.</p>	<p>15</p> <p>Bad Storm! No flying today. BRRRR! You are cold and hungry. Shiver for 10 counts, hold your belly, and go back 1 station.</p>
<p>16</p> <p>A pet cat catches you and eats you. The game is over for you. SORRY! You died. Die dramatically...then go back to the beginning and mark the chart.</p>	<p>17</p> <p>You just flew into a tall glass building in town. Sit down, hold your head, and count to 35. Then roll the die and move ahead the number of stations indicated.</p>	<p>18</p> <p>You just ran into a communications tower. The game is over for you. SORRY! Go back to the beginning and mark the chart.</p>
<p>19</p> <p>Good news!!! A good wind helps you fly. Move ahead 5 stations.</p>	<p>20</p> <p>After flying for several days, you land in a wildlife refuge. Spend time resting and eating from the abundance of food. Gulp 10 times, take a rest, then move ahead 4 stations.</p>	<p>21</p> <p>OOPS! An unexpected freeze causes food to become scarce. Go back 2 stations as you try to find more food.</p>
<p>22</p> <p>Bad luck! You have just joined a large flock of birds that has been exposed to disease. You get sick and die. SORRY! Die dramatically...then go back to the beginning and mark the chart.</p>	<p>23</p> <p>Uh-oh! You lost an important stopover spot when the wetlands were recently drained for a new building. Go back 1 station.</p>	<p>24</p> <p>Spend 5 days resting and feed in another wildlife refuge. Count to 40. Because you are so strong, you can fly to the finish!</p>



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.



Accredited by the American Association of Museums, Fairchild Tropical Botanic Garden is supported by contributions from members and friends, and in part by the State of Florida, Department of State, Division of Cultural Affairs, the Florida Council on Arts and Culture, the John D. and Catherine T. MacArthur Foundation, the National Endowment for the Arts, the Institute of Museum and Library Services, the Miami-Dade County Tourist Development Council, the Miami-Dade County Department of Cultural Affairs and the Cultural Affairs Council, the Miami-Dade County Mayor and Board of County Commissioners, and with the support of the City of Coral Gables.

FAIRCHILD TROPICAL BOTANIC GARDEN
Exploring, Explaining and Conserving the World of Tropical Plants

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