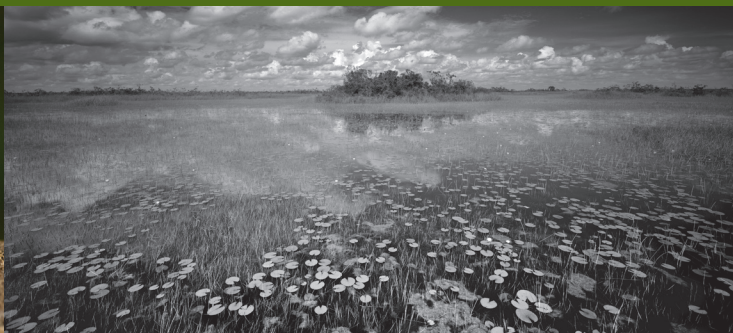


EVERGLADES EDUCATORS' GUIDE

at the Florida Museum of Natural History



The Florida Museum of Natural History is Florida's state museum of natural history. The Museum is dedicated to understanding, preserving and interpreting biological diversity and cultural heritage.

ACKNOWLEDGEMENTS



Florida Museum of Natural History

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This Educators' Guide to The Everglades Double Feature exhibit – ForEverglades:
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For more information about the variety of educational programming offered
by the Florida Museum, please visit our website:

www.flmnh.ufl.edu/education



Florida Sunshine State Standards

The Florida Museum of Natural History's Educators' Guides, in combination with ongoing teacher workshops, outreach, and field trips to its permanent and temporary exhibitions, will help you structure learning experiences that correspond to the following Florida Sunshine State Standards. All guides contain materials and online resources to supplement and enhance student learning in the classroom and during in-gallery experiences, tying Museum exhibits to the state standards and enhancing school fieldtrips.

Language Arts

Reading Standard 1:

The student uses the reading process effectively.

Reading Standard 2:

The student constructs meaning from a wide range of texts.

Writing Standard 1:

The student uses writing processes effectively.

Writing Standard 2:

The student writes to communicate ideas and information effectively.

Listening, Viewing and Speaking Standard 1:

The student uses listening strategies effectively.

Listening, Viewing and Speaking Standard 2:

The student uses viewing strategies effectively.

Math

Measurement Standard 1:

The student measures quantities in the real world and uses the measures to solve problems.

Data Analysis and Probability Standard 3:

The student uses statistical methods to make inferences and valid arguments about real-world situations.



continued

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Science

Processes that Shape the Earth Standard 2:

The student understands the need for protection of the natural systems on Earth.

Processes of Life Standard 1:

The student describes patterns of structure and function in living things

How Living Things Interact with Their Environment Standard 1:

The student understands the competitive, interdependent, cyclic nature of living things in the environment.

How Living Things Interact with Their Environment Standard 2:

The student understands the consequences of using limited natural resources.

The Nature of Science Standard 3:

The student understands that science, technology, and society are interwoven and interdependent.

Social Studies

Time, Continuity and Change Standard 1:

The student understands historical chronology and the historical perspective.

Time, Continuity and Change Standard 6:

The student understands the history of Florida and its people.

People, Places and Environments (Geography) Standard 1:

The student understands the world in spatial terms.

People, Places and Environments (Geography) Standard 2:

The student understands the interactions of people and the physical environment.

The Arts: Visual Arts

Cultural and Historical Connections Standard 1:

The student understands the visual arts in relation to history and culture.

Applications to Life Standard 1:

The student makes connections between the visual arts, other disciplines, and the real world.

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EVERGLADES DOUBLE FEATURE

Florida Museum of Natural History

Exhibit Description

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Florida is home to one of the world's most unique wetlands – the Everglades. It supports a rich diversity of plants and animals, some not found anywhere else. However, impacts to the Everglades have taken their toll on this delicate ecosystem. Take your students on a journey through this exhibit to discover the majesty of one of Florida's most unique natural features and learn about the dangers invasive species brings to the Everglades.

Produced by the Florida Museum of Natural History, the exhibit has two primary components:

ForEverglades: Photos by Clyde Butcher and Jeff Ripple, showcases the large format photography by these two well-known artists and captures the beauty of Everglades landscapes.

Alien Attack: Target Everglades, follows a top-ten countdown of the most invasive plants and animals in the Everglades. While the Everglades faces many serious challenges, few people know of these alien species (and the hundreds beyond the top ten) and their role in destabilizing the Glades.

This double-feature approach will both inspire students with the beauty of the Everglades and make them more aware of its fragile nature, its many challenges, and things they can do to support Everglades conservation.

This educator guide provides relevant background information, vocabulary, resources and activities to enhance your visit to the Florida Museum. Visit our website for more lesson plans and activities to use in the classroom: www.flmnh.ufl.edu/education/resources.htm



Sawgrass prairies are one of several ecosystems found in the Everglades.

PART ONE: FOREVERGLADES *Photos By Clyde Butcher and Jeff Ripple*



Florida Museum of Natural History

Introduction

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“There are no other Everglades in the world.”

So begins Marjorie Stoneman Douglas in her classic book, *The Everglades: River of Grass*, and this has been a guiding philosophy as we have photographed the Everglades over a period of more than 20 years.

The Everglades are subtle but multifaceted. Everyone knows the vast sawgrass marshes, but the Everglades system in its broadest sense also holds wide cypress prairies, meandering rivers, brooding mangrove swamps, emerald islands, shallow lakes (including Lake Okeechobee, the second largest lake in the continental United States), the estuarine richness of Florida Bay and the Ten Thousand Islands, and even a portion of the Florida Keys. It is a landscape born of and nourished by water.

We have approached this exhibit not as scientists but as artists, following the water of the Everglades wherever it most enchanted us. That journey has taken us from the Chain of Lakes just below Orlando west almost to Naples and as far south as the Keys. Our photographs were made at all times of day, but only when the landscape revealed in its unique, quiet way a moment that wrenched at the heart and held us captive.

We both use wooden view cameras, instruments that require us to visualize a scene as art before we even set up the camera to begin work. Texture, form, light, shadow—a pervading mood. We are the first and last people to see this place at this moment—there will never be another moment like it. And so we render it onto film.

There will never be another Everglades. The urgency of our work of the moment is reflected in our approach to this exhibit as a whole. The Everglades are in desperate danger. So, we present our vision of the Everglades to you as an invitation to bring the Everglades into your heart, to help ensure their survival. Please enjoy our work and join with us in keeping the Everglades for posterity.

~Clyde Butcher and Jeff Ripple



-Clyde Butcher



-Jeff Ripple

PART ONE: FOREVERGLADES *Photos By Clyde Butcher and Jeff Ripple*



Florida Museum of Natural History

Introduction continued

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Clyde Butcher

Clyde Butcher's black and white photographs explore his personal relationship with the environment and draw the viewer into a relationship with nature. For more than forty years, he has captured the beauty of natural landscapes with 8x10", 11x14" and 12x20" view cameras. The large format cameras allow him to express the elaborate detail and textures of the landscape, rendered in photographic prints ranging from 8x10 inches to 5x8 feet. Butcher's work has been featured in many exhibitions, film documentaries and books (including his own nine books). His numerous awards include the state of Florida's Artist Hall of Fame Award and Heartland Community Service Award, as well as the Sierra Club's Ansel Adams Conservation Award and a Lifetime Achievement Award from the North American Nature Photography Association. A large selection of Clyde's photography can be seen at his Venice Gallery & Studio in Venice, Florida, and at his Big Cypress Gallery on the Tamiami Trail in Big Cypress National Preserve.



For more information on Clyde Butcher check out his website at www.clydebutcher.com.

Jeff Ripple

Ripple's primary camera is a 4x5 field camera, which allows him to capture the subtleties of the natural landscape with amazing clarity. He works in both color and black & white and is completely self-trained in photography and photographic printmaking. Jeff's photographic images reflect his devotion to protecting the natural environment, his fascination with the ephemeral play of light on textures and forms in the landscape, and a reverence for wild places. He hopes that through his work people will develop a new appreciation for their natural heritage. His work is widely collected and he has exhibited in more than a dozen solo and group museum exhibits. He is also a painter, a nature recordist, and author of nine natural history books, primarily about Florida. Jeff currently works from studios near Big Cypress National Preserve in southwest Florida and in the tiny village of Empire at Sleeping Bear Dunes National Lakeshore in northwestern lower Michigan.



For more information on Jeff Ripple check out his website at www.jeffripple.com.



Background Information [adapted from Everglades National Park Natural History Curriculum]

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Florida is home to one of the world's most unique wetlands – the Everglades. Environmental activist Marjory Stoneman Douglas popularized the term “River of Grass” to describe the flow of water through sawgrass marshes, one part of a complex and unique system of interdependent ecosystems that includes cypress swamps, mangrove forests, hardwood hammocks, pinelands, and the estuarine and marine environments of Florida Bay. Located in the southern portion of the state, this subtropical wetland comprises the lower half of the large Kissimmee – Okeechobee – Everglades watershed. Historically, it covered over 4,000 square miles stretching from Lake Okeechobee to the Florida Bay. Today, it is less than half that size. The ever-changing Everglades are shaped by water and fire, with frequent flooding in the wet season and drought in the dry season.

The Geology and Hydrology of the Everglades

The geology and hydrology of the Everglades are the keys to understanding its ecosystems and their importance to south Florida. The first part of this section will explain the formation of south Florida, and the second will explain the aspects of Everglades hydrology.

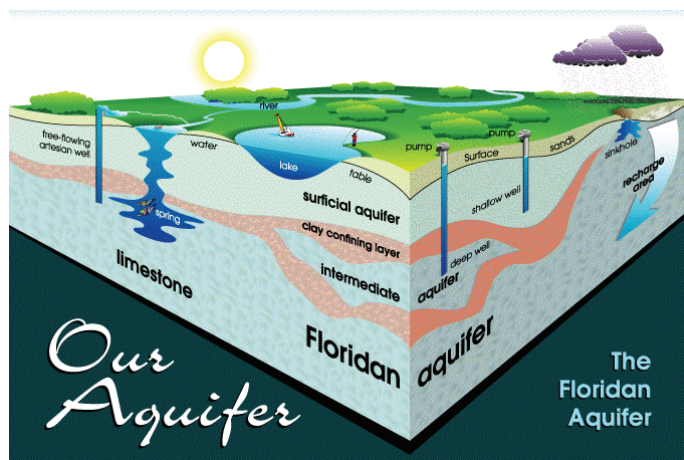
The Formation of South Florida and Its Aquifers

The peninsula of Florida is part of larger area of land, much of which is below sea level, known as the Florida Platform. The Florida Platform has been alternately exposed as dry land and submerged by shallow seas multiple times in its history. The frequent submergence of the Florida Platform is responsible for the geologic makeup of south Florida, which played an important role in the formation of the Everglades.

The body of water that covered Florida during periods of submergence was a fairly shallow sea.

This shallow water attracted marine life such as shellfish, corals, and fish. When these creatures died, their shells or skeletons would drift down to the seabed and eventually form limestone, a rock that is very important to the hydrology of Florida. When the water levels retreated, the limestone layers of south Florida were exposed and became dry land. Since limestone is permeable, or porous, it allowed water to seep through it and form aquifers, or areas beneath the ground that hold water.

South Florida receives a very high amount of rainfall (approximately 60 inches per year), and large amounts of fresh water from overflowing rivers and lakes seep into the aquifer through the limestone. However, not all water makes its way to the aquifers. Water seepage can be partially blocked by marl and peat, types of soils that are formed from decaying plant matter. Marl and peat built up over time in some areas of south Florida and seepage was slowed, resulting in standing water in some areas. The marl and peat in south Florida today play an important role in many Everglades habitats.





Background Information continued

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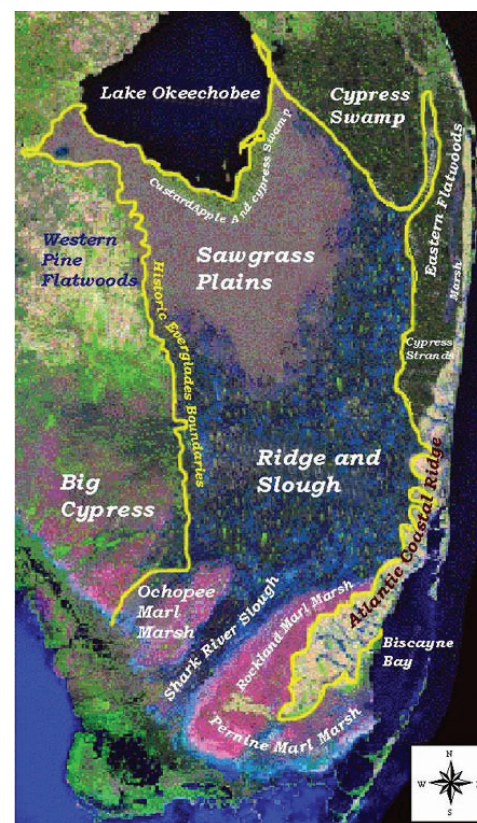
The ancient seas are also responsible for the shape of south Florida, which guides the movement of water through the Everglades. During the periods of submergence, the currents that flowed over the seabed would carry the bits of shell and skeleton to the outer edges of Florida, forming more limestone in these areas. The same currents would also erode the limestone rock that had already formed in other areas of the peninsula. As a result, south Florida is more bowl-shaped than flat – both the east and the west coasts of south Florida are slightly elevated. The elevated coasts slope downwards towards the middle of the state, creating a wide, shallow channel. This channel forces the Everglades' waters to flow to the south and southwest.

The Everglades Hydrology

The Everglades can be loosely described as a slow-moving river. This description was even more accurate in the past, before human alterations to the Everglades disrupted the water flow. The Everglades was formed by a combination of several things: large amounts of rainfall, a high water table combined with slow drainage, and the gentle slope of south Florida.

During the summer wet season, Lake Okeechobee and the other nearby rivers and lakes overflow each year. Not all of this flood water can be absorbed into the ground. Instead, it flows south and southwest, following the gentle slope of the ground. In some places, the peat and marl prevent water absorption into the limestone during the dry winter season, causing standing water to be present almost year-round. Over time the yearly flooding created a series of interconnected wetlands and shallow, slow-moving rivers approximately 50 miles wide and 100 miles long. The development of this massive system affected the ecosystems of the drier upland areas to the north and east and nearby estuarine environment of the Florida Bay.

The slow-moving fresh water of the Everglades plays several important roles to this day. It forms a watershed that moves water across the land to Florida Bay. The watershed region covers a large portion of south Florida and provides habitats for many rare and unique plants and animals. The fresh water flow also maintains a low-saline marine habitat for many aquatic creatures in the estuaries that feed the Bay. This watershed also replenishes the groundwater in the aquifer, which then provides fresh water for local plants and animals during dry seasons. The aquifer system of south Florida is also important to the human residents by providing most of the fresh water used by humans in Broward and Dade Counties. Finally, the flow of the fresh water into the Gulf and the Florida Bay, both over land and through the limestone, stops the salty seawater from flowing into the limestone and contaminating the aquifer. The decrease of fresh water flowing through the Everglades could cause saltwater contamination of the Biscayne aquifer.



Major landscape types in the Everglades before human action.



PART ONE: FOREVERGLADES *Photos By Clyde Butcher and Jeff Ripple*

Florida Museum of Natural History

Background Information continued

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Humans and the Everglades

Humans have inhabited Florida long before the Everglades existed. The earliest human settlements identified in Florida, belonging to the Paleo-Indians who first inhabited North America, are approximately 12,000 years old. The Miami-Dade area was settled approximately 10,000 years ago. Many Native American tribes have traveled through, lived around, or even lived in the Everglades since its formation 5,000 years ago. Europeans visited the Everglades in the 1500s, and Americans have inhabited south Florida since the 1800s. The different groups interacted with the Everglades in vastly different ways. The following section will briefly describe human interaction with the Everglades.

The Calusa

The Calusa were a Native American tribe that flourished in south Florida around the time of the Spanish exploration. The Calusa inhabited the west coast of Florida from present-day Fort Myers to the tip of the peninsula, and collected goods from other Native American tribes in south Florida. While the Calusa did not live in the Everglades proper, the Everglades were vital to their way of life. The tribal villages were positioned by estuaries and mangrove forests, and they were heavily dependent on the fish and other marine life that lived in these areas for food. The Calusa also made canoes out of cypresses and other Everglades trees, and frequently crossed the Everglades to trade with other Native American groups in south Florida and beyond. The Calusa declined following the Spanish invasion, and the last Calusa were either transported to Cuba or were adopted into the Seminole tribe in the 1800s.

The Seminole

The Seminole tribe developed sometime in the 1700s. As Europeans and later Americans settled the east coast of the United States, they systematically removed the Native Americans from the land. Escaping members of Georgian and Carolinian tribes, like the Creek, began to retreat into Florida for refuge. When Florida was turned over to the British in 1763, many tribes that sought refuge in Florida were forced even further south. The various tribes reincorporated into the Seminole tribe and, after several wars with the European and American settlers, sought refuge in the Everglades. There, the Seminole were joined by the Miccosukee tribe, escaped slaves fleeing Georgia and the Carolinas, and possibly remaining Calusas. The Seminole tribe and others who joined them lived in the hardwood hammocks of the Everglades, in small, close-knit family communities. They depended on the Everglades for food, water, and wood to build chickees and canoes for shelter and transportation. The coontie plant, cypress trees, cabbage palm, fish and turtles were staple resources for their survival. The Everglades itself also protected them from American soldiers and settlers who sought to remove them. The Seminole remained in the Everglades until the early 20th century, during which they began to leave the hammocks for settlements outside of the Everglades. Seminole tradition and culture, shaped by the Everglades, is carried on by tribe members today.



PART ONE: FOREVERGLADES *Photos By Clyde Butcher and Jeff Ripple*

Florida Museum of Natural History

Background Information continued

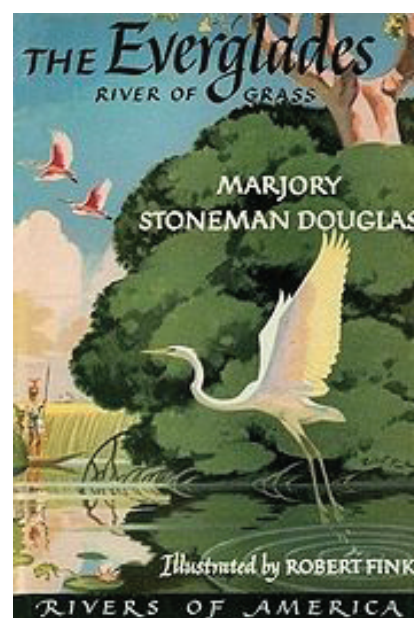
12

Other Native Americans in South Florida

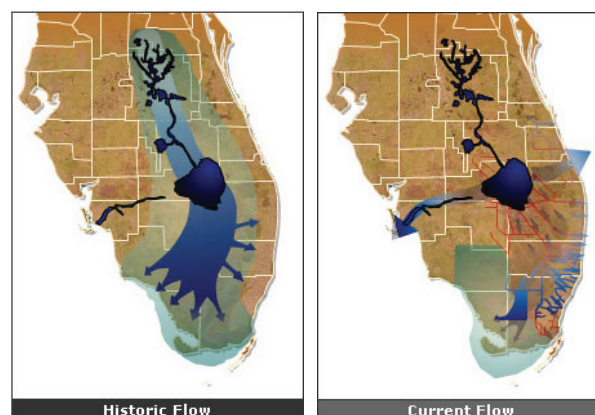
Many other lesser known groups of Native Americans lived in or around the Everglades. The Tequesta, Ais, Jaega and Key Indians lived to the east, north and south and most likely traveled and fished the Everglades. The Caloosahatchee inhabited the western edge of the Everglades. The Belle Glade and Glades I, II, and III cultures lived just south of the Okeechobee, in the sawgrass marsh area. All of these cultures benefited from the Everglades, whether from the abundance of fish, birds, and plants, the ease of travel by canoe, or the natural barrier the unpredictable landscape formed to protect the tribes from invaders. Many of these tribes are either thought to have been absorbed into other tribes (like the Seminole), were moved to Oklahoma on the Trail of Tears, or immigrated to Cuba.

American Settlement of South Florida and Interaction with the Everglades

American settlements near the Everglades were sparse until the south Florida land boom in the early 1900s. Even before the influx of settlers many Floridians viewed the Everglades as useless marshland, and were determined to reclaim (drain) it for farmland and to decrease flooding. Beginning in the 1880s, south Floridians dug canals to increase agricultural lands. As more people moved to south Florida, pinelands and mangrove forests were cleared for wood or to create sites for ocean side towns and more wetlands were drained for human habitation. In the early 1900s, activists such as Edward Coe pushed for conservation, resulting in the formation of the Everglades National Park in 1934. Conservation efforts continued when Marjory Stoneman Douglas, a conservationist and former editor of the Miami Herald, published *The Everglades: River of Grass* in 1947, a book that brought public attention to the importance of the Everglades and its destruction.



1948 marked a step backwards in conservation efforts when Congress passed the Central and South Florida Project, an order for a series of canals, levees, controls, and road systems to be built through the Everglades. These systems were constructed by the United States Army Corps of Engineers and were intended to protect human habitation from seasonal and hurricane-caused flooding, provide water to the Everglades National Park, and prevent salt water intrusion. Unfortunately, many of these structures divert water to the Gulf of Mexico and the Atlantic Ocean, decreasing the volume of water that flows through what remains of the Everglades and Florida Bay.



Courtesy of SFWMD



PART ONE: FOREVERGLADES *Photos By Clyde Butcher and Jeff Ripple*

Florida Museum of Natural History

Background Information continued

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Today, the Everglades are half the size they were when Americans began to settle south Florida, and have lost large numbers of native plants and animals. Invasive plants, bought by accident or planted on purpose, threaten even the protected areas of the Everglades National Park. Conservation efforts are still being made, including the \$8 billion-dollar Everglades restoration project approved by Congress in 2000. This project is designed to reroute some of the water back into the Everglades to restore some of the natural hydrology and wetland areas.

Habitats of the Everglades

While many people picture the Everglades as a marsh or swamp, it is actually a made up of many types of interdependent ecosystems, ranging from dry, upland ecosystems to the Florida Bay. The land is constantly cycling through different ecosystems in different places in order to maintain the delicate ecological balance that has made the Everglades so unique. This section will focus on a few types of habitats for each of the three major areas of the Everglades: the high ground communities, the freshwater wetlands, and the coastal ecosystems.

The High Ground Communities

Pinelands

The pineland ecosystems historically covered large parts of the Atlantic Coastal Ridge, just east of the Everglades. Today, many of the pinelands have been destroyed through land clearing and are considered an endangered ecosystem. The pinelands are primarily dry year round, although some are underwater for 2-3 months each year. Pineland forests are very diverse, housing many types of plants and animals. The most well-known plants of the pinelands are the slash pines, from which the pinelands are named, and the coontie plant, a native bush that was a food source for the Seminoles. The pinelands are also home to some endangered plants, such as the silver thatch palm and the pineland clustervine. The fauna of the forests range from typical forest animals – rabbits, mice, and raccoons – to some of the most endangered species in Florida, such as the Florida panther and the red cockaded woodpecker. Fire is essential to the survival of the pine forests because it removes hardwood trees that would shade out the pine seedlings. Slash pines have thick bark to protect them from fire and the cones with seeds are high up, away from the heat. Without fire, pinelands would become hardwood hammocks. The pinelands, which are already close to Miami and Fort Lauderdale, are threatened by further human development.

Hardwood Hammocks

Hardwood Hammocks are extremely dense subtropical forests that contain a variety of large hardwood trees, brush, and animals. North of Miami, hardwood hammocks tend to contain more temperate-climate trees like live oak, maple, and hackberry, while south of Miami they tend to contain more tropical and subtropical trees such as mahogany, gumbo limbo, coco-plum, and wild tamarind. The shade provided by the tall hardwood trees and the heat and humidity of south Florida create an excellent environment for ferns and climbing plants to grow.



Mature Hammocks form dense canopies.



Background Information continued

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Hardwood hammocks are located in areas that do not usually flood even during the rainy season, and are dotted throughout the Everglades and the Florida Keys. Hammocks provide homes to endangered plants (such as the buccaneer and Florida thatch palms) and animals (such as the Florida panther, wood stork and the key deer).

Freshwater Wetlands

Sawgrass Marshes

The sawgrass marshes (also called sawgrass prairies) are possibly the most easily recognized ecosystem in the Everglades – a flat, wide plain of yellowish grass-like plants stretching as far as the eye can see. They primarily grow in the northern and southern areas of the Everglades. These marshes are named after the most prevalent plant, sawgrass (which is actually a type of sedge), and contain various other aquatic plants in much smaller numbers. The types of aquatic plants in a sawgrass marsh depend on the length of the hydroperiod, or wet season. The floods each wet season usually create standing water two feet deep that lasts up to nine months. These floods encourage the growth of a type of algae, called periphyton, which floats on the surface of the standing water. This algal mat is a key part of the marsh food chain as it provides food to insects, amphibians and fish that live in the marsh. The decaying plant matter from the sawgrass, and the animals which feed on the periphyton, create a rich peat or marl soil that helps prevent seepage of fresh water into the limestone bedrock, allowing for the hydroperiod this ecosystem depends on. In late fall the sawgrass marshes begin to dry out, leaving only small pools of standing water in which the aquatic inhabitants of the marsh depend on during the winter dry season. While the marshes are not home to many large animals outside of the alligator, species such as wood storks and panthers frequently visit for water and food and the marshes are a major food source for migrating animals. Large areas of sawgrass marsh to the south of Lake Okeechobee were destroyed by early human drainage of the Everglades in the late 1800s and early 1900s, and sawgrass marshes all over the Everglades are susceptible to additional changes in water flow today.



Freshwater Sloughs

Freshwater sloughs (pronounced “slews”) are long areas of sawgrass marsh-like land that are much deeper than the typical sawgrass marsh. These areas are faster-flowing, contain deeper-water aquatic plants and animals and are responsible for much of the water movement of the Everglades. Sloughs are one of few areas of the Everglades that hold moderate amounts of water during the winter dry season, causing animals from many other ecosystems to migrate to the sloughs





Background Information continued

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during the driest parts of the year. There are many sloughs in the Everglades, but the two most important are the Shark River Slough, the largest, which feeds the Gulf of Mexico and Florida Bay, and the Taylor Slough, which empties into Florida Bay. The large sheet of flowing water produced by the two sloughs meeting is referred to as overland sheet flow, and is important to nearby ecosystems such as the Florida Bay. Many different species of flora and fauna live in and around the sloughs, from fish and insects to a wide variety of wading birds, raptors, and mammals like the otter and the black bear.

Other Freshwater Wetlands

Cypress communities are predominantly wet areas inhabited by their namesake plant, the cypress tree, the most flood-tolerant tree in Florida. Cypress trees can survive in standing water and are easily recognizable by their “knees” - projections of root that stick up above the water level to aid the tree in respiration and stability. Cypress communities are home to similar fauna as sawgrass marshes and sloughs. These trees will occasionally form cypress domes, circular communities where shorter cypresses surround taller cypresses. Epiphytes (air plants) are commonly seen growing on cypress trees. These plants attach to the tree bark and obtain all nutrients from the air – the bark is only used as a place of attachment.

Coastal Ecosystems

Florida Bay

The Florida Bay stretches from the tip of south Florida to the Keys, forming a shallow, warm bay fed by both the Gulf of Mexico and the freshwater Everglades. There are two major environments in the Florida Bay: the seagrass beds and hard bottom areas. Seagrass beds provide food and shelter for various marine animals. Although animals such as endangered manatees and sea turtles feed directly on the grasses, the primary food source in seagrass beds is the algae that grow on the seagrass. Hard-bottom environments are home to sponges, lobsters, various types of fish, dolphins, and small corals. They are estimated to cover 40% of the Florida Bay area. Due to the decrease in fresh water in the Everglades, the salinity of Florida Bay today is much higher than it was when historic water flows moved through the Everglades to the Bay.



Coral Reefs

The longest barrier reef in the United States is found along the Florida Keys and extends up the coast to Martin County. Coral reefs have the greatest biodiversity of all marine environments, and are often called the “rainforests of the sea.” They face multiple threats including pollution, overfishing, coastal construction, user impacts and global warming. Reefs are also dependent on surrounding ecosystems such as the Florida Bay seagrass and hard-bottom areas, and damage to these environments from the changing salinity of the Bay can directly affect the reef system.



Background Information continued

16

Mangrove Forests

Mangrove Forests are found near the coast in many areas of Florida, and are named after the most visible and common trees growing within them – the mangrove trees. Mangroves grow in areas with brackish water, where the fresh Everglades water begins to mix with the salty ocean water. The tall, arching, prop roots easily identify the red mangrove trees that grow closest to the water due to their high salt tolerance. Prop roots supply air to the underlying roots and provide stability to the tree. They also trap mud and silt that flows with the tide, thus gradually increasing the soil around them. Mangroves serve as a valuable nursery by providing shelter and food for many juvenile marine species until they are able to move into the Florida Bay or the Gulf of Mexico. During the dry months, wading birds congregate in mangroves to feed and nest. And during the summer months, these mangrove forests provide the first line of defense against the winds and storm surge of tropical storms and hurricanes. Coastal prairies are usually found alongside mangrove forests. They are stretches of grassland, shrubs or sparse trees near the coast, which usually develop when fire, hurricanes, or human development severely damages a mangrove forest.



Flora and Fauna of the Everglades

The varied habitats of the Everglades enable a large number of diverse plants and animals to survive. While populations have decreased drastically, the Everglades are still home to a wide range of species. This section will explore some of the different species found in the Everglades today.

American Alligator

Alligators live primarily in fresh water, although they will occasionally venture into brackish water for short periods of time. At an average length between 13 and 15 feet, alligators have the strength and speed to prey on most land mammals in the Everglades but usually feed on small mammals, fish, birds and reptiles. Alligators live primarily in marshes and sloughs, where they are vital to the ecosystem because of the “gator” holes they create when they dig into the marsh soil. These holes usually retain water during the dry season, providing a habitat for many animals when water is scarce. Alligators lay between 20 and 50 eggs at a time in nests found above water on the shores of marshes and sloughs. Mother alligators stay near the nest to protect the incubating eggs, and once hatched, usually protect the pod of juvenile alligators for up to a year. Alligators hibernate during winter, decreasing activity in temperatures under 80°F and ceasing to feed entirely at less than 73°F. The American alligator was once hunted and threatened, but has recovered due to closely monitored conservation efforts. The American alligator is closely related to two other species found in the Everglades, the American crocodile and the non-native caiman. Alligators can usually be identified by their broad, rounded snouts.



Photo by Jeff Gage



Background Information continued

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Florida Panther

The Florida panther ranged over the entire southeastern United States approximately 1500 years ago but because of human hunting and habitat destruction, they now only inhabit the Everglades. The current wild population is estimated to be between 80 to 100 adults, classifying the Florida panther as a critically endangered species. The panther is a carnivore, feeding on white-tailed deer, wild hogs, raccoons and armadillos. They prefer to live on the ground in hammocks, pinelands, hardwood swamps, cypress swamps, and occasionally prairies and freshwater marshes. The female panther will give birth to one to four cubs per litter, which they raise without help from male panthers. The cubs typically stay with the mother for less than two years. Panthers can live up to 12 years in the wild, and usually die from health issues such as rabies and congenital heart defects, or are killed by other panthers. Most panthers are approximately two feet high at the shoulder and six to seven feet in length. Adult males weigh between 100 and 150 pounds. Females are smaller, weighing between 65 and 100 pounds. Both males and females are born with black spots which fade to a reddish-tan coat in adulthood.



Wood stork

The wood stork, the only common stork in the United States, is an endangered species native to wetland communities. Unlike many wading birds, wood storks hunt by touch rather than sight, dipping their beaks into the water and feeling for prey. Since this technique requires a large amount of prey in a small area, wood storks usually begin to die off early and quickly when wetlands are in danger or destroyed. As a result, they are considered a key species to watch when monitoring wetland conservation. Approximately 1000 nesting pairs have been reported in the Everglades, up from the 100 nesting pairs reported in the 1980s. Wood storks are large, between two and a half to four feet tall with a five foot wingspan. Adult birds are white with dark, green or purple-tinged feathers on their tails and wing tips. Everglades wood storks begin breeding in November and build nests over water in cypress swamps, mangrove forests, or on islands. The nests are usually placed over standing water to deter predators from eating the eggs or young chicks. Both males and females raise the chicks. Although wood storks can be found in wetlands throughout the southeast coast of the United States, the population is concentrated in the Everglades.





Background Information continued

18

Manatee

Manatees are marine mammals that can be found in fresh, brackish and salty waters on the coast of the southeastern United States. They tend to inhabit Florida waters, but may range as far west as Texas and as far north as Virginia in warm summer months. Manatees are unusual because they have no natural predators. They are herbivores, and may eat up to fifteen times their body weight in vegetation in one day. Male manatees average 9.8 feet in length, weigh up to 1,200 pounds, and are believed to live up to 60 years in the wild. Unfortunately, due to threats from humans such as motorboat strikes, and natural threats such as red tide, most manatees in the wild die between 0 – 10 years of age and few live past 30 years. Manatees usually bear just one calf per birth, although twins are possible. The gestation period is approximately one year and mothers care for calves for about two years. In the Everglades, manatees are most commonly found in mangrove swamps and the Florida Bay.



Mangroves

There are three types of mangrove trees – red, black and white – and all of them are salt-tolerant, tolerate tidal submergence, and survive best in tropical climates. Red mangroves usually inhabit the coastline, a harsher environment than those in which white and black mangroves grow. They can be identified by their prop roots that grow from the trunk down into the ground. The red mangrove can grow up to 80 feet in proper conditions, but do not usually pass 20 feet in Florida. Black mangroves live further inland than red mangroves, in areas where tides are low enough to expose the black mangrove's roots to air. Similar to the cypress tree, the black mangrove has horizontal roots with pneumatophores, small pencil shaped projections that grow out of the ground from the roots. Black mangroves can grow to 65 feet in ideal climates, but usually only reach 50 feet in the Everglades. White mangroves are found on even higher ground and usually do not have visible roots, although they will grow pneumatophores in instances of long flooding or poor soil conditions. White mangroves grow to 50 feet and are extremely intolerant of cold. All three types of mangroves are vital to the Everglades ecosystem because they filter water and air pollutants, provide protection from erosion with their tangled prop roots, and serve as habitat for many juvenile marine and land animals before they migrate to the environments where they will live out their adult lives. Mangroves are imperiled by pollution, dredging (which can cause mangrove forests to be flooded, cutting off air flow to even their exposed roots), and human development.



Mangrove in Coot Bay. Photo by Jeff Ripple



Background Information continued

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Bald Cypress

The bald cypress is highly recognizable because of its size, growing up to 150 feet tall and 20 feet wide, and its root projections, called “cypress knees.” It is thought that the knees aid in respiration, providing required oxygen to the root tissues, and provide structural support in water-logged soils. Cypress trees are highly flood tolerant, growing along or in moving water. Like mangroves, they can also filter out some water pollution. Cypress trees have traditionally been harvested for their durable wood, to the point that the bald cypress has almost been replaced by its smaller relative, the pond cypress. They are found mainly in the southern Everglades, and many are stunted. The Big Cypress Swamp to the northwest of the Everglades is not considered part of the Everglades watershed region, although the two systems are deeply interconnected.



Guzmania Pond. Photo by Jeff Ripple



Vocabulary Words

20

accumulation – the places in which water will collect; also called collection

aquifer – a geological formation or structure that stores and/or transmits water; usually made of layers of permeable rock that contain water; source of water year round for surface-level local water bodies, and may also be tapped by humans to provide water to inhabited areas. The aquifers in the Everglades watershed are limestone aquifers.

brackish – water that is somewhat salty, but much lower salinity than most ocean water; common in estuaries where a freshwater river or marshland meets the ocean

condensation – the process of water vapor in the air turning into liquid water; the opposite process of evaporation; water drops on the outside of a cold glass of water are condensed water

cypress swamp – wet area that contains cypress trees, the most flood-tolerant trees in Florida

ecosystem – a community, including all the component organisms, along with the environment, forming an interactive system

endangered species – a species that is in danger of extinction in the near future throughout all or most of its range

estuary – a place where freshwater and salt water meet

evaporation – the process of liquid water becoming water vapor, including vaporization from water surfaces, land surfaces, and snow fields, but not from leaf surfaces

food chain – transfer of food energy from plants to one or more animals; a series of plants and animals linked by their food relationships

Florida Platform – a platform of land, mostly below sea level, that is approximately 350 miles at its widest and 450 miles at its longest. Areas of the Florida Platform that are above sea level make up the state of Florida.

geology – the study of rock and rock formations

ground water – 1) water beneath the earth's surface; 2) water that flows or seeps downward and saturates soil or rock, supplying springs and wells; 3) water stored underground in rock crevices and in the pores of geologic materials that make up the Earth's crust

habitat – the place where an organism lives



Vocabulary Words continued

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hard-bottom environment – a marine environment characterized by corals and sponges, similar to a coral reef ecosystem but lacking the biological density and diversity

hardwood hammock – wooded habitat found adjacent to marshes, pinelands, mangroves, and within the interior of some wetland tree islands

hydrologic cycle – the cyclic transfer of water vapor from the Earth’s surface via evapo-transpiration into the atmosphere, from the atmosphere via precipitation back to earth, and through runoff into streams, rivers, and lakes, and ultimately into the oceans; See water cycle.

hydrology – the study of water and its interaction with the environment

hydroperiod – the time each year when the land is covered in standing water

infiltration – water entering and passing through the ground

limestone – a type of permeable sedimentary rock that is primarily made of calcium carbonate; usually formed underwater from shells and skeletons of marine animals

mangroves – salt tolerant trees found where freshwater from the Everglades mixes with saltwater from the ocean

marl – deposits of soil formed in and near freshwater areas, usually made up of calcium carbonate and clay

native species – a species that naturally occurs in an ecosystem

non-native species – any species that has been introduced into an ecosystem that it does not naturally occur in (also called alien, exotic, introduced)

overland sheet flow – sheets of water which flow over the surface of a large land areas

peat – partially decayed plant matter that gathers on the surface of wetland soils

periphyton – a thick layer of algae that coats rocks, plants and water surfaces, common in fresh water habitats

permeable – allowing fluids or gasses to pass or diffuse through

pinelands – dominated by slash pines, this habitat has the richest diversity in the Everglades



Vocabulary Words *continued*

22

precipitation – rain, snow, hail, sleet, dew, and frost

saturation – excess water on the ground; flooding

sawgrass – a yellow-green plant with serrated edges (leaves); a type of sedge, not a true grass

seagrass – a type of plant that grows on the bottoms of bodies of water; in the Everglades system, seagrass areas are found primarily in the Florida Bay

sloughs – main routes of moving water through the Everglades

surface water – water that is on the Earth's surface, such as in a stream, river, lake, or reservoir

threatened species – a species that may become endangered in the near future throughout all or most of its range

water cycle – water vapor from the Earth evaporates into the atmosphere where it forms clouds, precipitation, and falls back to Earth running off into streams, rivers, lakes, and ultimately into the oceans

water table – the top of the water surface in the saturated part of an aquifer

watershed – 1) the land area that drains water to a particular stream, river, or lake; 2) a geographical region where all precipitation flows into a set of streams, a river, or another body of water; watersheds can be very small, like the Hogtown Creek watershed in Gainesville, or large, like the Everglades which contains many smaller watersheds



Pre Activities

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Where are the Everglades?

Grades K-8

The geography and locations of natural features in relation to metropolitan areas can give a greater understanding of the connection humans have with our natural environment.

Materials:

Map of Florida

Actions:

1. Show students a map of Florida
2. Ask the students to point to various locations on the map. Suggested places:
 - Where they live
 - Where other family lives
 - Where they go to school
 - Disney World
 - Miami
 - The Florida Keys
3. Ask the students to find the Everglades.
4. Ask students questions relevant to the topography and geography of the Everglades:
 - What rivers feed into the Everglades?
 - How far north do these rivers run?
 - Where do these rivers empty into the Gulf of Mexico?
 - How wide are the Everglades?
 - How close is a large city?

What are the Everglades?

Grades K-8

The Everglades are defined as a subtropical wetland located in the southern portion of Florida, comprising the southern half of a large watershed. It is a complex system of interdependent ecosystems.



Pre Activities continued

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Actions:

1. Read Marjory Stoneman Douglas' quote to the students:

"There are no other Everglades in the world. They are, they have always been, one of the unique regions of the Earth, remote, never wholly known. Nothing anywhere else is like them: their vast glittering openness, wider than the enormous visible round of the horizon, the racing free saltiness and sweetness of their massive winds, under the dazzling blue heights of space. They are unique also in the simplicity, the diversity, and the related harmony of the forms of life they enclose. The miracle of light pours over the green and brown expanse of saw grass and water, shining slow-moving below, the grass and water that is the meaning and the central fact of the Everglades of Florida. It is a river of grass."

Marjory Stoneman Douglas, 1947

2. Discuss the phrase, "river of grass" with students. What does it mean?

Like other rivers, the water in the Everglades flows. The Everglades is a wide expanse of freshwater marshes that relies on slow moving water. While it is not a typical river with a defined channel, water does flow southwest from Lake Okeechobee through the marshes, cypress swamps, open water sloughs and mangrove forests to Florida Bay. Because plants like sawgrass cover much of the area, "river of grass" is a fitting description.

Other people had similar names for the Everglades:

Pa-hay-okee – Grassy Water (Native Americans)

Laguna del Espíritu Santo – Lagoon of the Holy Spirit (Spanish)

River Glades (British surveyors)

3. Use the background information in this guide to discuss the diverse habitats found in the Everglades. How are the habitats alike and different? What animal and plant species are found in them?

PART ONE: FOREVERGLADES Photos By Clyde Butcher and Jeff Ripple



Florida Museum of Natural History

Field Trip Activity

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Everglades Photography

Grades 3-8

Art is used to inspire students with the beauty of the Everglades and make them more aware of its fragile nature, its many challenges, and things they can do to support Everglades conservation.

Actions:

1. To prepare students, have them read the questions below prior to your visit. Students will answer the questions while viewing the exhibit.
2. Author and conservationist Marjory Stoneman Douglas called the Everglades the “River of Grass.” After viewing the photographs, would you say this is an accurate description? Why or why not?



Mangroves and Bedrock. Photo by Jeff Ripple

3. Choose a photograph that you feel strongly about. What is it about this photograph that drew your attention? Use the box below to describe why you like this photograph.

Title: _____

Artist: _____

Year: _____

List adjectives to describe this photo:

I chose this photograph because:



Post Activities

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Everglades Photography

Grades 3 – 8

Using your answers from the field trip activity, write a narrative response to the photograph you chose from the Clyde Butcher and Jeff Ripple exhibit. Begin by explaining what the Everglades are; next describe the photography in full sentences using your list of adjectives, and finally, write your reaction to this photograph. Some questions to consider: What did you see in the photograph? How did it make you feel? What would you say to the artist who took this photograph?

Nature Walk

Grades K – 8

Take a walk on school property or a nearby park to observe the natural environment. Try to use all five senses in your observation, except for taste. To demonstrate taste, discuss items that different animals you see on your walk might taste.

Actions:

Younger students:

1. Talk about each of the senses as you conduct your nature walk.
 - **Sight:** What color are the leaves on the tree?
 - **Smell:** What did you smell?
 - **Hear:** What do you hear? Do you hear the leaf crunching?
 - **Touch:** What does the bark feel like? What does it feel like to crunch the leaf in your hand?
 - **Taste:** What are the animals tasting?
2. Have the students collect samples of things they “sense” during the walk. Discuss the items later to reinforce the concepts.
3. Have students do a leaf rubbing, nature collage, or a drawing of what they “sensed” during the nature walk.

Older students:

1. Have students write a sentence (or do an illustration) about each of the senses they used on the walk.
 - **Sight:** What did you see?
 - **Smell:** What did you smell?
 - **Hear:** What did you hear?
 - **Touch:** What did you feel?
 - **Taste:** What did the animals (if any) taste?
2. Students will collect samples of things they “sense” during the walk. Discuss the items later or use them in a project.
3. Have students do a leaf rubbing (set aside) and write a poem about nature. When they are done with their poem, they can copy it over the top of their leaf rubbing.

PART TWO: ALIEN ATTACK: *Target Everglades*



Florida Museum of Natural History

Introduction

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Among the many challenges to the Everglades, plants and animals from other parts of the world are a real threat. According to the Everglades Cooperative Invasive Species Management Area, there are nearly 200 invasive species currently invading the delicate ecosystem. These are plants and animals that do not naturally live in the Everglades and out-compete the native species and cause damage to their habitat.

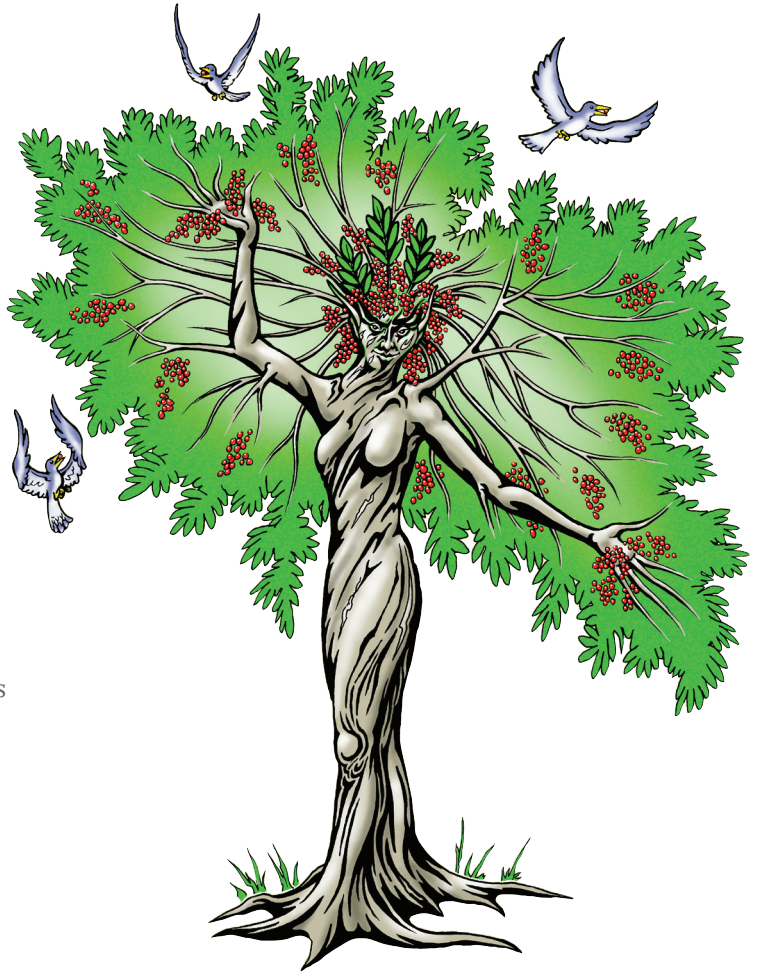
In this exhibit you will discover the top ten alien invaders harming the Everglades.

What is an invasive or alien species?

An invasive or alien species is a plant or animal that is introduced into an area where it does not naturally live. Uncontrolled invasive species are considered bad news, but the vast majority of species have not been studied. Experts debate the types of competitive pressure these species exert on our native flora and fauna.

What's the big deal?

- It is estimated that over 50,000 species have been introduced into the US.
- Invasives cause almost \$120 billion in loss and damage per year in the US.
- Over half of the endangered species in the US are threatened by invasives.



PART TWO: ALIEN ATTACK: *Target Everglades*



Florida Museum of Natural History

Background Information

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Humans are not the only immigrants to the United States. Thousands of animal, plant, and microbial species are also newcomers to this country. Because they were brought here from another place, they are called non-native, exotic, introduced, or alien species. Exotic species that make their way into natural wild ecosystems can threaten the native habitats and the organisms in them. Those with adaptations that allow them to out-compete the native species for food, shelter, or space are called invasive species.

Most invasive species reproduce and spread rapidly, compete with native species for food and shelter and lead to the decline and perhaps extinction of native species. Furthermore, they have no natural predators or stresses in their new environment so their population grows unchecked, causing further pressure on the established ecosystem.

Native Species: A species that occurs naturally in an area or habitat, without direct or indirect human action.

Non-Native Species: Any species that appears beyond their natural environment through artificial means. These include plants and animals transported to new areas on purpose or by accident, from another continent, state or even habitat. While non-native species are not necessarily invasive, they always have the potential to become invasive. Also called exotic and introduced species.

Invasive Species: An invasive species is a non-native species that has escaped cultivation or captivity and is causing environmental or economic harm.

Why are invasive species a problem?

Invasive species are a problem because they can seriously upset or even destroy local ecosystems. They do so by reproducing faster than native species, disrupting the distribution of resources, and eliminating native species.





PART TWO: ALIEN ATTACK: *Target Everglades*

Florida Museum of Natural History

Background Information continued

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What do the most harmful invasive species have in common?

They:

- have no natural predators in their new home.
- reproduce and spread rapidly.
- compete with native species for food and shelter.
- lead to the decline and perhaps extinction of native species.

How do invasive species spread?

Invasive species spread into new areas by direct or indirect human action. They can spread through:

- exotic pet trade. Reptiles, amphibians, and aquariums (containing non-native vegetation and fish) are often released and dumped into the environment when their owners decide to no longer care for them.
- landscaping by planting invasive species.
- hitchhiking by attaching to boats (both large ocean-going vessels and small vessels), outerwear (coats, boots, shoes, diving suits), automobiles, etc.
- packaging of shipped soils, seeds and other outdoor products.

How do we manage invasive species?

Because it is unlikely that an established non-native plant species can be eradicated from natural areas, we often have to settle for the goal of “maintenance control.” This means using all appropriate tools to “control” or keep the plants at the lowest level possible while conserving or enhancing native plants.

There are several control methods used, depending on the plant and its habitat:

- Chemical control is the use of specially formulated herbicides (registered with the U.S. EPA and the Florida Department of Agriculture and Consumer Services) to kill plants.
- Biological control is the use of imported insects, fish and other organisms which eat, infect or otherwise keep the invasive plants at low levels indefinitely. Before releasing such organisms, the USDA and the Florida Department of Agriculture and Consumer Services must verify that the insect biocontrols have proven to be host-specific.
- Mechanical is the use of specially-made machines to “harvest” invasive plants by cutting and collecting them and transporting them to a place to decompose.
- Physical control includes drawdowns (water removal), flooding, burning, dredging, shading and manual labor to control invasive plants.
- Integrated control is the use of two or more of the above methods.

PART TWO: ALIEN ATTACK: *Target Everglades*



Florida Museum of Natural History

Background Information continued

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Invasive species found in the Everglades: Many invasive species exist in the Everglades.

Listed below are the ten species profiled in the Alien Attack: Target Everglades exhibit.

The Green Strangler: **Old World climbing fern** (*Lygodium microphyllum*)

This leafy fern creeps up, climbs up and covers up other plants to compete for sunlight, slowly strangling its host tree. Wind spreads the ferns' spores far and wide, allowing it to colonize vast areas. It can grow up to 90 ft (27.4 m) long and form a root mat 3 ft (0.9 m) thick.

Crimes against the Everglades

This "Green Strangler" blocks sunshine and kills mature trees, tree islands, and cypress stands. The bromeliads and orchids that live in these trees also die, as well as ground-dwelling plants. Perhaps most damaging are the destructive "crown fires" that the vine helps spread to the forest canopy.



Courtesy of IFAS

Country of Origin

The Old World climbing fern is native to Africa, southern Asia, and Australia. It was first recorded in a Florida nursery in 1957 and was collected in the wild in 1960. By 1978, it was well-established and wreaking havoc in south Florida.

What Can We Do?

- The Old World climbing fern can be controlled with herbicide, but get professional advice on its use.
- If you have Old World climbing fern on your property, contact a county extension office for assistance in reporting and eradication.
- Stay tuned to research conducted on bio-control agents, such as moths and mites.

Is Gainesville In Danger?

Our defenses are holding: the Old World climbing fern has only been reported in south Florida.

The Toxic Trespasser: **Brazilian pepper** (*Schinus terebinthifolius*)

The "Toxic Trespasser" has proven to be a difficult foe to vanquish. Don't let its pretty red berries and nickname, "Florida holly," fool you: this evergreen shrub can produce a nasty rash in some people, and invades natural areas with a vengeance.



Courtesy of IFAS



PART TWO: ALIEN ATTACK: *Target Everglades*

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Crimes against the Everglades

Brazilian pepper-trees thrive in disturbed and moist areas and form dense, closed-canopy forests that shade out other vegetation. It forms huge monocultures (a single species) that are poor habitat for wildlife. Their berries, which some Florida bird species love to eat, are sometimes toxic.

Countries of Origin

Native to Brazil, Paraguay and Argentina, the Brazilian pepper is now found as far north as St. Augustine, on the east coast of Florida. This invasive was introduced to Florida in the 1840s as an ornamental plant and is now well-established in Central and South Florida.

What Can We Do?

- Obey the law! It is illegal to buy or sell Brazilian pepper-trees in Florida without a special permit.
- Volunteer during eradication programs.
- Learn to identify this shrub and call a local government agency if you spot it in natural areas.
- Practice and encourage native plant-scaping.

Is Gainesville In Danger?

As of now, only one Brazilian pepper has gotten through our local defenses. It was immediately removed.

Siphonator:

Melaleuca (*Melaleuca quinquenervia*)

Melaleuca was released upon the Everglades to suck up all that water and make the land “useful.” The “Siphonator” worked too well: its thick stands can exceed 130,000 saplings and trees per acre. Control of the melaleuca covering over 450,000 acres costs over \$2 million per year.

Crimes against the Everglades

Melaleuca produces millions of seeds, each capable of sprouting almost anywhere. This windborne colonizer displaces native vegetation and produces little food for animals. Melaleuca’s noxious oils cause asthma-like symptoms in some people. These oils, along with its dense growth, increase fire hazards.



Courtesy of IFAS

Country of Origin

Melaleuca is native to Southeast Asia and eastern Australia. Australian seeds were imported in the early 1900s for landscaping. Seeds were scattered over the Everglades to promote forest growth in the 1930s. Natural wind dispersal spread it further.



PART TWO: ALIEN ATTACK: *Target Everglades*

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What Can We Do?

- Obey the law! It is illegal to possess, buy, or sell melaleuca in Florida without a special permit.
- Support eradication programs by purchasing melaleuca wood chips for mulch.
- Learn to identify this shrub and report it to a local government agency if you spot it in natural areas.
- Practice and encourage native plant landscaping.

Is Gainesville In Danger?

Our lakes and rivers are safe for now: the melaleuca is only terrorizing bodies of water in south Florida.

The Gilled Aggressor:

Mayan cichlid (*Cichlasoma urophthalmus*)

The “Gilled Aggressor” is the top-ranked animal in our countdown. This aggressive fish can reach lengths of 11 in (28 cm) and can beat up just about everyone in the neighborhood. It eats almost anything, including other fish, invertebrates, plants, even yucky organic material called “detritus” on the bottom.

Crimes against the Everglades

The Mayan cichlid lives in many different habitats and competes with native fish for resources, such as food and breeding grounds.

It is not picky about its diet, which includes juveniles of native fish, such as sunfish, tarpon, and snook. In some spots, they’ve completely replaced the native fish fauna.



Courtesy of USGS, Buck Albert

Countries of Origin

The Mayan cichlid’s native range includes Mexico, Belize, Guatemala, Nicaragua, and Honduras. Scientists don’t know how Mayan cichlids got to Florida. They may have been imported for the exotic fish trade. The first Florida record is from 1983.

What Can We Do?

- Never release unwanted aquarium animals and plants into the wild!
- Learn the differences between this invasive and our native species.
- If you see a Mayan cichlid where it is unrecorded, report it to a local government agency dealing with freshwater invasive species, like a water district authority or your state wildlife commission, or the U.S. Fish and Wildlife Service.

Is Gainesville in Danger?

It’s not on the radar yet. This fish is only currently found bullying the native aquatic species in South Florida.



PART TWO: ALIEN ATTACK: *Target Everglades*

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Background Information continued

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The Demonic Plague:

Black rat (*Rattus rattus*)

The only mammal on our countdown, the black rat has a long history as a dangerous pest to humans and wildlife. This rat can spread several nasty diseases, including the bubonic (black) plague. They can live in almost any habitat, though they prefer drier, coastal areas.

Crimes against the Everglades

The black rat is directly responsible for the decline and extinction of several species of seabirds throughout the world. In the Everglades, it eats various plants and animals, including bird eggs and the young of several bird species. It also competes with native wildlife for food and shelter.



-Eric Zamora

Countries of Origin

Probably originating in India, the black rat has spread throughout much of the globe. The black rat is also known as the “ship rat” for its habit of stowing away on ships. The first Spanish explorers unwittingly brought black rats to Florida in the 1500s.

What Can We Do?

- Be good to snakes! A snake in your yard will help keep your house and neighborhood rat-free.
- Learn the differences between black rats and native rats and mice.
- Make sure your home is a bad habitat for black rats. Keep pet food, birdseed, and any other foods stored outside in closed containers and keep your garbage area tidy.

Is Gainesville in Danger?

The black rat has jumped ship – right into our back yard! This species can be found throughout Alachua County.



PART TWO: ALIEN ATTACK: *Target Everglades*

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Background Information continued

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Sticky Feet:

Cuban tree frog (*Osteopilus septentrionalis*)

This colossal tree frog has bragging rights as the largest tree frog in North America and it has an appetite to match! “Sticky Feet” doesn’t care what it eats. It’s commonly seen hanging out in residential areas in Florida. Females are much larger (6 in, 15.2 cm) than males.

Crimes against the Everglades

It’s a hostile takeover! The Cuban tree frog eats anything that fits into its large mouth, including insects, spiders, lizards, small snakes, native frogs, even its own kind. Its tadpoles aggressively compete with native tadpoles for resources. This buffet-style feeding frenzy upsets the natural ecological balance of the Everglades.



-Eric Zamora

Country of Origin

The Cuban tree frog is native to Cuba (Isla de Juventud), Cayman Islands, and the Bahamas. Sticky Feet is a sneaky hitchhiker – it probably entered the U.S. at Key West in the 1920s on shipping crates, but was not officially recorded until the early 1930s. It hitches rides on anything it can hang on to, such as automobiles, boats, and potted plants.

What Can We Do?

- Learn the differences between this invasive and our native species.
- Remove any tree frogs from your vehicle, boat and trailers before travel.
- If you see a Cuban tree frog, contact a government agency dealing with invasive species such as your state wildlife commission or the U. S. Fish and Wildlife Service.
- Visit <http://edis.ifas.ufl.edu/UW259> to learn a humane method to euthanize these pests.

Is Gainesville in Danger?

The Cuban tree frog has already made its move – Gainesville has recently been infiltrated! We can expect to see more of these hopping around our back yards and a lot fewer native tree frogs hopping with them.



PART TWO: ALIEN ATTACK: *Target Everglades*

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Background Information continued

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The Constrictor:

Burmese python (*Python molurus bivittatus*)

A wild adult Burmese python, one of the largest snakes, reaches 23 ft (7 m) in length and weighs about 200 lbs (90.7 kg). Its stunning looks and typically passive personality make it a favorite pet. Yet a wild beast lurks within. Python handlers and their family members are sometimes fatally attacked. The “Constrictor” feeds on mammals, birds, and other reptiles, which it tracks with a deadly arsenal of chemo-receptors and heat sensors. It grabs prey with recurved teeth, throws body coils around it, and squeezes until the target suffocates.



-Eric Zamora

Crimes against the Everglades

Pythons compete for food and space with endangered animal species. Birds, mammals, reptiles, deer, even alligators have been recorded as prey. Burmese pythons love water and thrive in varied habitats, such as pine rocklands, grasslands, and forests. The Everglades is a perfect hangout.

Country of Origin

The Burmese python hails from parts of Southeast Asia, southern China, and a few isolated spots in eastern and northern India. Pet owners released pythons into the wild because of their large size and high food cost. Others may have escaped from cages with their incredible strength. The first Everglades report of The Constrictor was in 1979.

What Can We Do?

- Never release unwanted pets into the wild! Contact a zoo or pet adoption service instead.
- Learn to distinguish this invasive from our native species. If you see a Burmese python in the wild, do not approach it. These animals can be very dangerous!
- Contact a government agency dealing with invasive species such as your state wildlife commission or the U. S. Fish and Wildlife Service.

Is Gainesville in Danger?

So far, so good. This species hasn't managed to slither into Alachua County.



PART TWO: ALIEN ATTACK: *Target Everglades*

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The Swamp Thing:

Purple swamphen (*Porphyrio porphyrio*)

Don't let the Purple Swamphen's beauty fool you. This chicken-sized invasive wreaks havoc on plants and small animals. Its bill is perfectly shaped for eating just about anything. The "Swamp Thing's" huge feet with long claws allow it to maneuver just above the water in freshwater habitats with abundant reeds and grass.

Crimes against the Everglades

The Purple Swamphen eats vegetation, but it likes flesh too, feeding on snails, small fish, reptiles and amphibians, even young birds. In short, it competes well with many native animal species for food and space. Eradication programs have not stopped the Swamp Thing's populations from increasing.



Purple Swamphen in Wakodahatchee Wetlands, Delray Beach

Country of Origin

The Purple Swamphen occurs from Europe east to New Zealand. The North American population may have originated in Southeast Asia. A few swamphens escaped from bird breeders. The Swamp Thing was first recorded in North America in Pembroke Pines, Florida in the late 1990s and has run amok ever since.

What Can We Do?

- If keeping non-native species, make sure the enclosure is secure and that you have the proper permits. Never release unwanted pets into the wild! Contact a zoo or pet adoption service.
- Learn the differences between this invasive and our native species.
- If you see a Purple Swamphen, contact a government agency dealing with invasive species such as a local water authority, your state wildlife commission, or the U.S. States Fish and Wildlife Service.

Is Gainesville in Danger? For now, this bird hasn't flown north to Alachua County.



PART TWO: ALIEN ATTACK: *Target Everglades*

Florida Museum of Natural History

Background Information continued

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The Slimenator:

Island apple snail (*Pomacea canaliculata*)

This large, freshwater snail has a BIG appetite. The “Slimenator” slimes its way through life doing little else but eating. Like most snails, it is equipped with a radula, a feeding organ made of many rows of replaceable teeth. This remarkable adaptation makes snails perfect aquarium glass cleaners.

Crimes against the Everglades

The Island apple snail invades habitats of our native snails, consuming large amounts of aquatic vegetation and sometimes smaller snails and their eggs. Loss of aquatic vegetation is bad news because it provides safe haven for young fish and other animals and helps cleanse the water of harmful compounds.

Country of Origin

The Island apple snail emigrated from the Paraná River in central South America (Argentina, Bolivia, Brazil, Paraguay and Uruguay). Humans released this species into the wild from aquaria. It has been spotted throughout much of Florida, southern Georgia, and Texas. It may have been seen in South Florida in 1991, but the first confirmed record was in 2002.

What Can We Do?

- Never release unwanted aquarium plants and animals into the wild!
- Learn the differences between this invasive and our native species.
- If you see one of its distinctive eggs, contact your local government agency dealing with fresh water invasive species, for instance, a water district authority or your state wildlife commission, or the U.S. Fish and Wildlife Service.

Is Gainesville in Danger?

This snail has already slimed its way into our local ecosystems.



Eggs of *Pomacea canaliculata*



Suckerlips:

Orinoco sailfin catfish (*Pterygoplichthys multiradiatus*)

This muck-sucking critter is the peskiest of the several invasive armored catfish that thrive in the Everglades. Its mouth points downward and is surrounded by fleshy lips. “Suckerlips” grows to almost 20 inches (50 cm) long and flourishes in fresh and brackish water habitats.

Crimes against the Everglades

The Orinoco Sailfin Catfish usually works undercover at night. This armored tank plows through vegetation, disrupting everything. It feeds on algae and detritus but also vacuums up fish eggs, insect larvae, snails and small plants. When eaten by birds, such as brown pelicans, this catfish may extend its fin spines and choke the bird to death.

Country of Origin

The Orinoco Sailfin Catfish is native to northern South America in the Orinoco River Basin of Venezuela and Colombia. These fish were released by pet owners or escaped tropical fish rearing operations. They were well-established in Florida by the 1970s. Populations are also known from Hawaii, Texas, Mexico, Puerto Rico, and Taiwan.

What Can We Do?

- Never release unwanted aquarium animals and plants into the wild.
- Learn the differences between this invasive and our native species.
- If you see an Orinoco Sailfin Catfish where it is unrecorded, report it to a local government agency dealing with freshwater invasive species, like a water district authority or your state wildlife commission, or the U.S. Fish and Wildlife Service.

Is Gainesville In Danger?

The Orinoco Sailfish is often sited in our waters, but we have a natural defense it can't get around easily: a longer cold period than it is accustomed to. A long, hard cold snap, like those that usually occur every few years, can decimate the Sailfish's ranks.



PART TWO: ALIEN ATTACK: *Target Everglades*



Florida Museum of Natural History

Vocabulary

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adaptation – a characteristic or behavior that makes a plant or animal more suited to its environment

alien species – see non-native species

biological control – the purposeful introduction of natural enemies (insects, pathogens, etc.) as a means of weakening and suppressing invasive plants

colonize – to populate a new area

competition – an interaction between two species which can result in a disadvantage to one or both of the species

invasive species – a non-native species that is causing harm to the environment

native species – a species that naturally occurs in an ecosystem; also called indigenous species

non-native species – any species found outside of its natural range; a species that has been transported to an area that it is not normally found in; also called alien, exotic, introduced, and non-indigenous species

predator – any animal or other organism that hunts and kills other organisms (their prey)



PART TWO: ALIEN ATTACK: *Target Everglades*

Florida Museum of Natural History

Pre Activity

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Alien Invasion

Grades 3-8

One troublesome invasive plant in Florida's rivers, lakes and ponds is the water hyacinth (*Eichornia crassipes*). It is a beautiful, free-floating aquatic herb that is easily recognized by its lavender and blue flowers. The flowers are arranged in a spike that is held erect above a floating cluster of leaves.

Water hyacinths are native to Central and South America but were brought into the U.S. for an exposition held in New Orleans in 1884. Because of their beauty, they were taken home by conference attendees to add to backyard ponds. By 1900 they had escaped cultivation and become serious pests, clogging waterways throughout the coastal states.

The water hyacinth's success in its new habitat can be traced to a number of adaptations:

Fanlike leaves – makes an effective sail that allows the plant to spread easily when the wind blows

Spongy stems – the stems are filled with air spaces to keep the plant afloat

Feathery roots – allow the plant to absorb nutrients easily from the water

Reproduction – can reproduce in a variety of ways: 1) Fragmentation, or breaking into smaller pieces caused by boat propellers, thrashing swimming animals, grazing by animals, wave action caused by storms; 2) Forming plantlets at the end of a shoot from the base of the stem; 3) They also reproduce with seedlings.

These adaptations give water hyacinths an advantage over native, floating aquatic plants.

Materials:

- Identification card: http://plants.ifas.ufl.edu/misc/reco_cards/eiccra.pdf
- Hand lens
- Colored pencils
- Water hyacinth plant (*three options*):
 - 1) may be found in local waterway (*Note: after use, dispose of plants by completely drying or freezing them and placing them with garbage that will NOT be composted.*)
 - 2) artificial ones can be purchased at www.drsofostersmith.com
 - 3) lineart drawing (*included*) and online images at <http://plants.ifas.ufl.edu>



PART TWO: ALIEN ATTACK: *Target Everglades*

Florida Museum of Natural History

Pre Activity continued

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Actions:

1. Using information in this educator's guide, review the terms: native, non-native and invasive species with students.
2. Students will observe characteristics of the invasive water hyacinth that allow it to adapt to our waterways and out-compete native species. 3. Examine the water hyacinth (*if using a live specimen, allow it to float in water*) Sketch and label: leaves, flower (*if present*), roots and stem/bladder.
4. Look at the shape of the leaves. How might this shape aid the plant in spreading to a new location? (*If using a live plant in water, blow across the surface of the water.*)
5. What is the benefit of a dense, feathery network of roots in an aquatic environment?
6. When the waterway dries up, water hyacinths have been seen to continue to thrive. How might their root structure be beneficial when the environment becomes dry?
7. Cut one of the stems off the plant and slice through the inflated portion called the bladder (*or view an online image*). Explain how this hollow stem lined with air spaces is a benefit to the plant.
8. Examine the flower and sketch it. What adaptations make this flower attractive to pollinating insects?
9. A water hyacinth can have many blooms on one flower head. How is it beneficial to a plant to have many flowers in a single place?
10. Notice how new sections of the plant seem to grow out from the original. If the plant is broken into pieces, each piece can take root and grow into a new plant. How is this type of reproduction, called fragmentation, an adaptation for survival?

PART TWO: ALIEN ATTACK: *Target Everglades*



Florida Museum of Natural History

Pre Activity continued

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Eichhornia crassipes

Eichhornia crassipes
Water hyacinth

Copyright 1996 University of Florida
Center for Aquatic and Invasive Plants

Lineart by Ann Murray, University of Florida, Center for Aquatic and Invasive Plants.
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PART TWO: ALIEN ATTACK: *Target Everglades*

Florida Museum of Natural History

Field Trip Activity

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Everglades "Most Wanted"

Grades 3-8

Most people think that alien species come from outer space. Alien species (or non-native species) are plants and animals that have been transported to an area that they are not normally found in. They can be harmful to the native species that live there. This exhibit displays some of the most harmful alien species invading the Everglades.

Investigate these species and complete a profile chart and illustration for each to determine why these plants and animals made the Everglades Top 10 Most Wanted list.

Species: _____

Alias: _____

Country of Origin: _____

Method of Infiltration: _____

Crimes against the Everglades: _____



Species: _____

Alias: _____

Country of Origin: _____

Method of Infiltration: _____

Crimes against the Everglades: _____



PART TWO: ALIEN ATTACK: *Target Everglades*



Florida Museum of Natural History

Field Trip Activity continued

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Species: _____

Alias: _____

Country of Origin: _____

Method of Infiltration: _____

Crimes against the Everglades: _____



Species: _____

Alias: _____

Country of Origin: _____

Method of Infiltration: _____

Crimes against the Everglades: _____



PART TWO: ALIEN ATTACK: *Target Everglades*



Florida Museum of Natural History

Field Trip Activity continued

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Species: _____

Alias: _____

Country of Origin: _____

Method of Infiltration: _____

Crimes against the Everglades: _____



Species: _____

Alias: _____

Country of Origin: _____

Method of Infiltration: _____

Crimes against the Everglades: _____



PART TWO: ALIEN ATTACK: *Target Everglades*



Florida Museum of Natural History

Field Trip Activity continued

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Species: _____

Alias: _____

Country of Origin: _____

Method of Infiltration: _____

Crimes against the Everglades: _____



Species: _____

Alias: _____

Country of Origin: _____

Method of Infiltration: _____

Crimes against the Everglades: _____





PART TWO: ALIEN ATTACK: *Target Everglades*

Florida Museum of Natural History

Field Trip Activity continued

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Species: _____

Alias: _____

Country of Origin: _____

Method of Infiltration: _____

Crimes against the Everglades: _____



Species: _____

Alias: _____

Country of Origin: _____

Method of Infiltration: _____

Crimes against the Everglades: _____



PART TWO: ALIEN ATTACK: *Target Everglades*



Florida Museum of Natural History

Field Trip Activity ANSWER KEY

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Species #1: Old World Climbing Fern (*Lygodium micophyllum*)

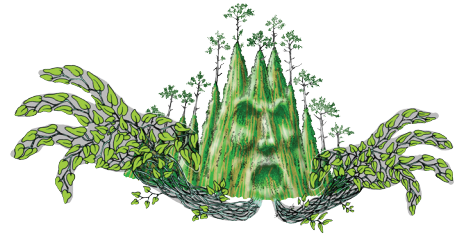
Alias: The Green Strangler

Origin: Africa, southern Asia, and Australia

Methods of Infiltration: First recorded in a Florida nursery in 1957

Crimes Against the Everglades: Fast growth allows it to climb up and block sunshine which kills mature trees, tree islands, and cypress stands, as well as orchids, bromeliads and ground-dwelling plants; also helps spread “crown fires” to the forest canopy

Has it breached Gainesville’s border?: No



Species #2: Brazilian Pepper-Tree (*Schinus terebinthifolius*)

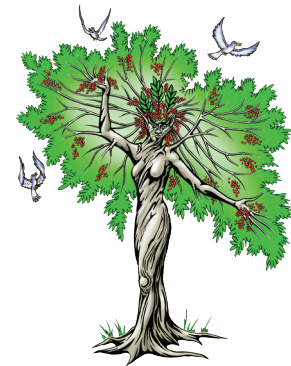
Alias: The Toxic Trespasser, Florida Holly

Origin: Brazil, Paraguay and Argentina

Methods of Infiltration: Introduced to Florida in the 1840s as an ornamental plant and is now well-established in Central and South Florida

Crimes Against the Everglades: Form dense, closed-canopy forests that shade out other vegetation; berries are sometimes toxic

Has it breached Gainesville’s border?: No



Species #3: Melaleuca (*Melaleuca quinquenervia*)

Alias: Siphonator

Origin: Southeast Asia and eastern Australia

Methods of Infiltration: Seeds were imported in the early 1900s for landscaping. Seeds were scattered over the Everglades to promote forest growth and suck up water in the Everglades.

Crimes Against the Everglades: Produces millions of seeds, each capable of sprouting almost anywhere; displaces native vegetation and produces little food for animals; its noxious oils, along with its dense growth, increase fire hazards

Has it breached Gainesville’s border?: No



Species #4: Mayan Cichlid (*Cichlasoma urophthalmus*)

Alias: Gilled Aggressor

Origin: Mexico, Belize, Guatemala, Nicaragua, and Honduras

Methods of Infiltration: Unknown; may have been imported for the exotic fish trade.

Crimes Against the Everglades: Lives in many different habitats and competes with native fish for resources, such as food and breeding grounds

Has it breached Gainesville’s border?: No



PART TWO: ALIEN ATTACK: *Target Everglades*



Florida Museum of Natural History

Everglades “Most Wanted” ANSWER KEY *continued*

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Species #5: Black Rat (*Rattus rattus*)

Alias: Demonic Plague

Origin: Probably originating in India; the black rat has spread throughout much of the globe

Methods of Infiltration: The first Spanish explorers unwittingly brought stowaway black rats to Florida in the 1500s.

Crimes Against the Everglades: Directly responsible for the decline and extinction of several species of seabirds throughout the world. In the Everglades, it eats various plants and animals, including bird eggs and the young of several bird species.

Has it breached Gainesville’s border?: Yes



Species #6: Burmese Python (*Python molurus bivittatus*)

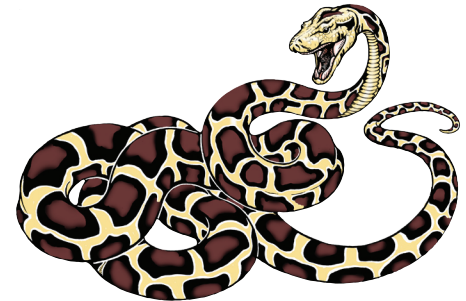
Alias: The Constrictor

Origin: Southeast Asia, southern China, and a few isolated spots in eastern and northern India

Methods of Infiltration: Released by pet owners; others may have escaped from cages

Crimes Against the Everglades: Compete for food and space with protected animal species – birds, mammals, reptiles, deer, even alligators have been recorded as prey

Has it breached Gainesville’s border?: No



Species #7: Cuban Tree Frog (*Osteopilus septentrionalis*)

Alias: Sticky Feet Swamp Thing

Origin: Cuba (Isla de Juventud), Cayman Islands, and the Bahamas

Methods of Infiltration: Likely entered the U.S. at Key West well before the 1920s by stowing aboard shipping crates

Crimes Against the Everglades: Eats anything, including insects, spiders, lizards, small snakes, native frogs, even its own kind; tadpoles aggressively compete with native tadpoles for resources

Has it breached Gainesville’s border?: Yes



PART TWO: ALIEN ATTACK: *Target Everglades*



Florida Museum of Natural History

Everglades “Most Wanted” ANSWER KEY *continued*

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Species #8: Purple Swampphen (*Porphyrio porphyrio*)

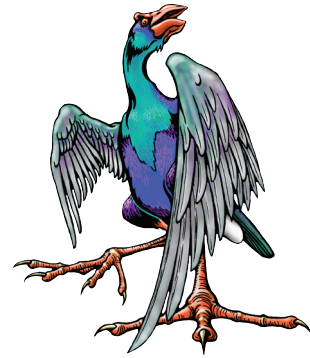
Alias: Swamp Thing

Origin: Europe east to New Zealand, the North American population may have originated in Southeast Asia

Methods of Infiltration: Escaped from bird breeders

Crimes Against the Everglades: Eats native plants and animals; competes well with many native animal species for food and space

Has it breached Gainesville’s border?: No



Species #9: Island Apple Snail (*Pomacea insularum*)

Alias: Slimenator

Origin: Paraná River in central South America

Methods of Infiltration: Released into the wild from aquaria

Crimes Against the Everglades: Invades habitats of native snails, consumes large amounts of aquatic vegetation and sometimes smaller snails and their eggs

Has it breached Gainesville’s border?: Yes



Species #10: Orinoco Sailfin Catfish (*Pterygoplichthys multiradiatus*)

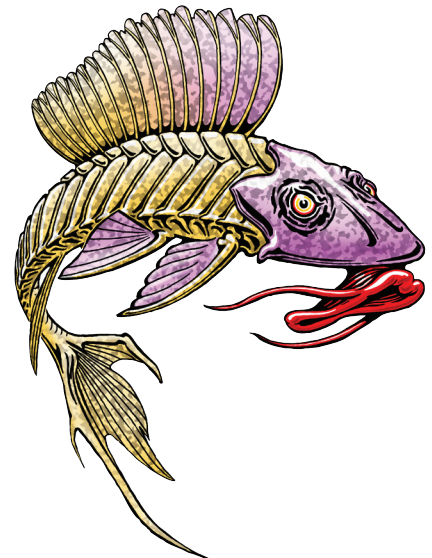
Alias: Suckerlips

Origin: Orinoco River Basin of Venezuela and Columbia

Methods of Infiltration: Released by pet owners, escaped tropical fish rearing operations

Crimes Against the Everglades: Feeds on algae and detritus, vacuums up fish eggs, insect larvae, snails, and small plants, may also choke birds that eat it by puffing its spines up

Has it breached Gainesville’s border?: Yes





PART TWO: ALIEN ATTACK: *Target Everglades*

Florida Museum of Natural History

Post Activities

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Everglades “Most Wanted”

Grades K-8

Have each student make a “most wanted” poster for one of the alien invader species seen in the exhibit. This poster should include an illustration, the name of the species, and basic information from the species profile chart.

Poet Tree

Grades K-5

Poetry can be an effective way to convey feelings or information. Students will be able to describe the basic ecology of a particular invasive species and write a poem about it.

Materials:

Pictures of 2 – 3 invasive species

Actions:

1. Cut a tree trunk and branches out of butcher paper or poster board and attach it to the wall.
2. Show pictures of the invasive species seen in the Alien Attack: Target Everglades exhibit and review their basic ecology and problems caused by them.
3. Brainstorm words and phrases relating to the invasive species and list them on the board.
4. Have the class select an invasive species and write the name vertically on the tree trunk.
5. Ask the students to write facts or feelings relating to the invasive species on leaf-shaped pieces of paper and attach them to the tree branches to create a Poet-Tree.
6. Have the students suggest words or phrases that start with the letters from the invasive species and write the words horizontally. This is called an acrostic poem. Younger students can create a class poem. Older students can write their own poems and share them with the class.

For Example:

Melaleuca
Menace
Exotic
Likes water
Australia
Leaves no room for natives
Expensive to remove
Uses lots of water
Cut them down
A lot of seeds

PART TWO: ALIEN ATTACK: *Target Everglades*



Florida Museum of Natural History

Post Activities continued

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Super Species!

Grades 4-8

Students will describe how certain adaptations give invasive species a competitive advantage over native plants and animals and create their own invasive species that prospers on planet Diversity.

Materials:

Pictures and descriptions of invasive species (local or from the exhibit)

Drawing paper

Colored pencils or markers

Optional: various art/craft supplies

Actions:

1. Remind students that an adaptation is a characteristic or behavior that makes a plant or animal more suited to its environment. Use the pictures and information from this guide to discuss specific adaptations that invasive species have that allow them to out-compete native species.
2. Students will design a plant or animal that can survive in one of the habitats on Planet Diversity. Not only must it be able to withstand the environment, it must also be able to take over and out-compete the native species that share the same habitat.
3. Describe Planet Diversity. There are a few different habitats on it:
 - an extremely arid desert filled with succulents and cacti, very little water
 - a wet, humid marsh area with oxygen depleted soil
 - mountain tops that experience cold, dry weather all year, and are covered with snow eight months of the year



PART TWO: ALIEN ATTACK: *Target Everglades*

Florida Museum of Natural History

Post Activities continued

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It may be helpful for students to think about the following questions:

- What are the characteristics of the environment I picked? (*Example: some common characteristics of a marshland are wet soil, lots of water, and a tendency to flood*)
 - What kind of plants and animals live in this environment? (*Example: a hot desert would be more likely to have water-retaining plants like cacti and succulents and predominantly nocturnal animals*)
 - What kind of adaptations do those plants and animals have? (*Example: animals that live on mountain tops need a way of keeping warm, adaptations for easy climbing, and would possibly be adapted to using snow as a water source*)
 - How do these adaptations help these plants and animals survive? What are similar types of adaptations that my invasive species can have?
 - What kinds of predators live in the environment I chose? What kind of adaptations can my invasive species have to protect it from these predators?
4. Students can draw and write about their species, using the following questions to guide them:
- What habitat does my species live in?
 - What kind of adaptations does it have that allow it to flourish in its new environment?
 - How does it protect itself from native predators or diseases?
 - Is it a plant or an animal?
 - If it is an animal, is it an herbivore, carnivore or omnivore? If it is a plant, is it a producer or a parasite?
 - How does it interact with native plants and animals?
 - What is its overall effect on the environment? (*All students should be able to explain that their invasive species' effect on the environment is bad.*)
5. Students present their drawings and/or descriptions to the class. Wherever possible, make comparisons to real plant or animal adaptations. Discuss real examples of non-native species out-competing native species. Include where exotics came from and how they got here.

PART THREE: TEACHER & STUDENT RESOURCES



Florida Museum of Natural History

Books

54

Ake, Anne E. **“Everglades: an Ecosystem Facing Choices and Challenges.”** Sarasota, FL: Pineapple Press, 2008.
Middle, High School

Asch, Frank. **“Sawgrass Poems: A View of the Everglades.”** Orlando: Harcourt, 1996.
Elementary

Benyus, Janine M. **“The Field Guide to Wildlife Habitats of the Eastern United States.”** New York: Simon & Schuster, 1989.

Cherry, Lynne. **“The Sea, the Storm, and the Mangrove Tangle.”** Dallas, PA: Berryville Graphics, 2004.
Pre-school, Elementary

Corwin, Jeff and Elaine Pascoe. **“The Jeff Corwin Experience - Into Wild Florida (The Jeff Corwin Experience).”** Chicago: Blackbirch Press, 2003.
Pre-school, Elementary

Crowe, Carole. **“Turtle Girl.”** Honesdale, PA: Boyds Mills Press, 2002.
Elementary

Curtis, Jennifer Keats. **“Turtles in My Sandbox.”** Mount Pleasant, SC: Sylvan Dell Publishing, 2006.
Pre-school, Elementary

DeFelice, Cynthia. **“Lostman’s River.”** New York: Avon Books, 1994.
Middle School

Dennard, Deborah. **“Alligators and Crocodiles (Our Wild World).”** Minnetonka, MN: NorthWord Books, 2003.
Middle School

Douglas, Marjory Stoneman. **“Alligator Crossing.”** Minneapolis, MN: Milkweed Editions, 2003.
Middle School

Farley, Walter. **“The Black Stallion’s Ghost (Black Stallion).”** New York: Yearling, 1990.
Middle School

Fazio, Wende. **“Everglades National Park (True Books: National Parks).”** Danbury, CT: Children’s Press, 1999.
Pre-school, Elementary

Feeney, Kathy. **“Manatees (Our Wild World).”** Minnetonka, MN: NorthWord Books, 2001.
Elementary, Middle School



PART THREE: TEACHER & STUDENT RESOURCES

Florida Museum of Natural History

Books continued

55

Fichter, George S. **"Turtles, Toads and Frogs Junior Guide (A Golden Junior Guide)."** New York: Golden Books, 1993.

Elementary

Florida Flair Books Staff. **"The Everglades Coloring Book."** Boynton Beach, FL: Florida Flair Books, 1982.

Elementary

George, Jean Craighead. **"Everglades."** New York: Harper Trophy, 1997.

Fiction, Elementary

George, Jean Craighead. **"The Missing 'Gator of Gumbo Limbo: An Ecological Mystery."** Topeka, KS: Topeka Bindery, 1999.

Elementary, Middle School

George, Jean Craighead. **"The Talking Earth."** New York: HarperCollins, 1987.

Elementary, Middle School

Graf, Mike. **"Everglades National Park."** Mankato, MN: Bridgestone Books, 2003.

Elementary

Grunwald, Michael. **"The Swamp: the Everglades, Florida and the Politics of Paradise."** New York: Simon and Schuster, 2006.

Guiberson, Brenda Z. **"Into the Sea."** New York: Henry Holt and Co., 2000.

Elementary

Hall, Margaret. **"Everglades National Park."** Chicago: Heinemann Library, 2006.

Elementary

Hamilton, John. **"Everglades National Park (National Parks)."** Edina, MN: ABDO Publishing Company, 2005.

Elementary, Middle School

Hiaasen, Carl. **"Hoot."** New York: Knopf Books for Young Readers, 2004.

Elementary, Middle, High School

Hiaasen, Carl. **"Scat."** New York: Knopf Books for Young Readers, 2009.

Elementary, Middle School

PART THREE: TEACHER & STUDENT RESOURCES



Florida Museum of Natural History

Books continued

56

Jacobs, Francine. “**Sam the Sea Cow (Reading Rainbow Books).**” New York: Random House, 1992.
Pre-school, Elementary

Jay, Lorraine A. “**Sea Turtles (Our Wild World).**” Minnetonka, MN: NorthWord Books, 2000.
Elementary, Middle School

Jumper, Betty Mae. “**Legends of the Seminoles.**” Sarasota, FL: Pineapple Press, 1994.
Elementary, Middle School

Keene, Carolyn. “**Lost in the Everglades (Nancy Drew Mystery Stories # 161).**” New York: Aladdin Paperbacks, 2002.
Middle School

Lasky, Kathryn. “**She’s Wearing a Dead Bird on Her Head!**” New York: Hyperion Books, 1999.
Elementary

Lawrence, Anne. “**This is Your Land (Leveled books).**” New York: Macmillan/McGraw-Hill, 2002.
Elementary

Leotti-Bachem, Janice, Everglades (Rookie Read-About Geography) Jefferson City, MO: Scholastic, 2005.
Elementary

Love, Donna. “**Henry the Impatient Heron.**” Mount Pleasant, SC: Sylvan Dell Publishing, 2009. (Currently awaiting release.)
Pre-school, Elementary

Lourie, Peter. “**Everglades: Buffalo Tiger and the River of Grass.**” Honesdale, PA: Boyds Mills Press, 1998.
Elementary, Middle School

Marx, Trish. “**Everglades Forever: Restoring America’s Great Wetland.**” New York: Lee & Low Books, Inc., 2004.
Elementary, Middle School

Monroe, Mary Alice. “**Turtle Summer: A Journal For My Daughter.**” Mount Pleasant, SC: Sylvan Dell Publishing, 2007.
Elementary

Morgan, Sheryl Koenig. “**The Everglades (Let’s Take a Trip).**” Jefferson City, MO: Troll Communications, 1990.
Elementary, Middle School

PART THREE: TEACHER & STUDENT RESOURCES



Florida Museum of Natural History

Books continued

57

Naylor, Phyllis Reynolds. **“To Walk the Sky Path.”** New York: Yearling, 1992.
Elementary, Middle School

Orr, Katherine. **“The Wondrous World of the Mangrove Swamps of the Everglades and Florida Keys.”**
Boynton Beach, FL: Florida Flair Books, 1989.
Middle School

Perera, Hilda. **“Kiki: a Cuban boy’s adventures in America.”** Glen Burnie, MD: The Pickering Press, 1992.
Elementary, Middle School

Quigley, Mary. **“Wetlands Explorer.”** Chicago: Raintree, 2004.
Middle School

Ring, Susan. **“Where Should Turtle Be?.”** Mount Pleasant, SC: Sylvan Dell Publishing, 2009. (Awaiting release.)
Pre-school, Elementary

Rorby, Ginny. **“Dolphin Sky.”** New York: Putnam Juvenile, 1998.

Sawyer, Kem Knapp. **“Marjory Stoneman Douglas: Guardian of the Everglades.”** Carlisle, MA: Discovery Enterprises Ltd, 1993.
Middle School

Smith, Patrick. **“A Land Remembered, Vol. 1 (Student Edition).”** Sarasota, FL: Pineapple Press, 2001.
Middle, High School

Smith, Patrick. **“A Land Remembered, Vol. 2 (Student Edition).”** Sarasota, FL: Pineapple Press, 2001.
Middle, High School

Skurzynski, Gloria. **“Deadly Waters: A Mystery in Everglades National Park.”** Washington, DC: National Geographic Children’s Books, 1999.
Elementary, Middle School

PART THREE: TEACHER & STUDENT RESOURCES



Florida Museum of Natural History

Web Resources

58

Atlas Project, University of South Florida
www.plantatlas.usf.edu

Comprehensive Everglades Restoration Plan – Educator Resources
http://www.evergladesplan.org/education/educ_resources.aspx

Environmental Protection Agency – Wetland Education
<http://www.epa.gov/owow/wetlands/education>

Everglades Cooperative Invasive Species Management Area
www.evergladescisma.org/

Everglades National Park – Educator Resources
www.nps.gov/ever/forteachers/index.htm

Exploring Florida – Social Studies Resources for Students and Teacher
<http://fcit.usf.edu/florida>

Florida Everglades
<http://www.florida-everglades.com>

Florida Fish and Wildlife Conservation Commission – Exotic Fish
www.myfwc.com/fishing/fishes/nonnative.html

Florida Fish and Wildlife Conservation Commission – Exotic Plants
www.myfwc.com/nonnatives/InvasivePlants/index.htm

Florida Native Plant Society
www.fnps.org

Herpetology at the Florida Museum of Natural History
www.flmnh.ufl.edu/herpetology

Ichthyology at the Florida Museum of Natural History
www.flmnh.ufl.edu/fish/southflorida/pisces.html

Mangrove Trees in Florida
www.floridaplants.com/horticulture/mangrove.htm

PART THREE: TEACHER & STUDENT RESOURCES



Florida Museum of Natural History

Web Resources continued

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Nature Conservancy

www.nature.org/initiatives/invasivespecies

South Florida Archaeology at the Florida Museum of Natural History

www.flmnh.ufl.edu/sflarch

Southwest Florida Water Management District

www.swfwmd.state.fl.us/education

St. John's River Water Management District

<http://sjr.state.fl.us/education/index/html>

UF IFAS Center for Aquatic and Invasive Plant

<http://plants.ifas.ufl.edu/education>

PART THREE: TEACHER & STUDENT RESOURCES



Florida Museum of Natural History

Videos

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Leave Only Bubbles “**Alligators & Birds of the Everglades Double Feature.**” 60 min. DVD: Leave Only Bubbles, 2004.

Discovery Education “**Aquatic Habitats.**” 48 min. video: Discovery Education, 1997.

The Best of the Everglades National Park “**Exploring the Wilderness Waterway.**” 30 min. DVD: Everglades National Park, 1993.

“**Everglades: Odyssey.**” 51 min. video: Tapeworm Productions, 1998.

Discovery “**Everglades: River of Life.**” 45 min. DVD: Discovery DVD, 2005.

Steve Greenberg “**Gators, Crocs and Other Yucky Swamp Creatures.**” 28 min. video: Big Kids Productions, 1996.

Jack Hambrick “**The Highwaymen: Florida’s Outsider Artists.**” 58 min. video: Janson Media, 2002.

David Counts “**Lady of the Glades.**” 28 min. video: David Counts, 1996.

Nature Parks “**Nature Parks: Everglades, Florida.**” 45 min. DVD: Global Television and Arcadia Films, 2008.

Water’s Journey “**Everglades: Restoring Hope.**” 56 min. DVD: Karst Productions, 2006.

Water’s Journey “**Everglades: Currents of Change.**” 56 min. DVD: Karst Productions, 2006.

Audubon Video “**Wood stork, Barometer of the Everglades.**” 60 min. Audubon Video, 1988.



PART THREE: TEACHER & STUDENT RESOURCES

Florida Museum of Natural History

Current Research at the Florida Museum

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Florida Museum of Natural History Research and Collections

http://flmnh.ufl.edu/museum/research_collections.htm

Ichthyology

www.flmnh.ufl.edu/fish/southflorida/pisces.html

The goal of South Florida Aquatic Environments is to provide an interactive, internet-based program that increases public awareness and understanding of three imperiled south Florida ecosystems – the Everglades, Florida Bay, and Florida Keys. Human impacts and conservation issues, as well as the role of museum collections in providing a historical taxonomic and distribution database, are included. South Florida Aquatic Environments also shares and interprets valuable collection-based data from the Florida Museum of Natural History's Ichthyology Collection (UF). The UF collection of fishes is a large and comprehensive assemblage of more than 2 million specimens, representing more than 7,000 species. The principal strengths of the UF collection consist of western and eastern Atlantic shelf and deepwater marine fishes, western Atlantic reef fishes, North American freshwater fishes, especially from the southeastern United States, and freshwater fishes from certain parts of Central America, South America and the West Indies.

South Florida Archaeology

www.flmnh.ufl.edu/sflarch

The South Florida archaeological collections contain materials from 13 counties (Broward, Charlotte, Collier, Miami-Dade, Glades, Hendry, Highlands, Lee, Martin, Monroe, Okeechobee, Palm Beach, and St. Lucie). This area includes 14,666 square miles, about 27% of the area of Florida. Systematic artifact collections are most comprehensive for southwest Florida. There are also important reference collections from elsewhere in south Florida, including the so-called "Cushing Collection," the Van Beck Collection excavated from the Marco Midden in the 1960s, the extensive Fort Center collection, artifacts from Key Marco, artifacts collected by John Goggin on which the major systematic artifact typologies for south Florida are based; and all artifacts, pre-Columbian and post-contact, that have been excavated since 1983 by the Southwest Florida Project (e.g., Horr's Island, Cash Mound, Galt Island, Buck Key, Josslyn Island, Useppa Island, and the Pineland Site Complex).

Herpetology

www.flmnh.ufl.edu/herpetology

With approximately 202,000 specimens, the FLMNH herpetology collection is estimated to be the 9th largest in the U.S. Its skeletal collection, with more than 11,000 disarticulated skeletons and a small number of cleared and stained specimens, is 5th largest. An average of 3,800 new specimens is cataloged each year. Look under the Florida Reptiles and Amphibians heading on the Herpetology website for information about species living in Florida, both native and exotic.

PART FOUR: RELATED EXHIBITIONS AND PROGRAMS



Florida Museum of Natural History

Permanent Exhibitions

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Northwest Florida: Waterways and Wildlife | This exhibit follows water as it flows through the unique environments of northwest Florida, the most biodiverse region of the state. Explore a hardwood hammock featuring a life-sized limestone cave, a seepage bog with its carnivorous plants, a Native American trading scene and more.



South Florida People & Environments | This exhibit celebrates the story of native people in South Florida and the environments that supported them. Walk along a boardwalk through a mangrove forest, travel underwater to view larger-than-life marine creatures, visit the house of a Calusa leader and much more.



Hall of Florida Fossils: Evolution of Life & Land | Drawing upon the Florida Museum's internationally acclaimed fossil collections, this award-winning exhibit describes the last 65 million years of Florida's history. Walk through time beginning with the Eocene, when Florida was underwater, to the Pleistocene when the first humans arrived 14,000 years ago.



Butterfly Rainforest & Butterfly Exhibits | Stroll through this 6,400-square-foot screened, outdoor enclosure with subtropical and tropical plants and hundreds of living butterflies. View thousands of Lepidoptera species on the "Wall of Wings" and learn about butterfly and moth biology. See scientists working in the Butterfly Rearing Lab and the Research Labs.



Fossil Plant Garden | This outdoor exhibit, located next to the Museum entrance, is landscaped with modern species of plants whose ancestors lived millions of years ago and are preserved as fossils in many places around the world.



Florida Wildflower & Butterfly Garden | This outdoor demonstration garden is the Museum's newest addition. Located just west of the Museum, the garden showcases Florida's native wildflowers and their importance as host and nectar plants for Florida's native butterflies.

Children's Natural History Artwork | Admire artwork created by elementary students to complement the Changing Gallery 1 exhibit. In this collaborative project with Alachua County Public Schools, elementary art teachers integrate science and social studies concepts into the art curriculum.



PART FOUR: RELATED EXHIBITIONS AND PROGRAMS

Florida Museum of Natural History

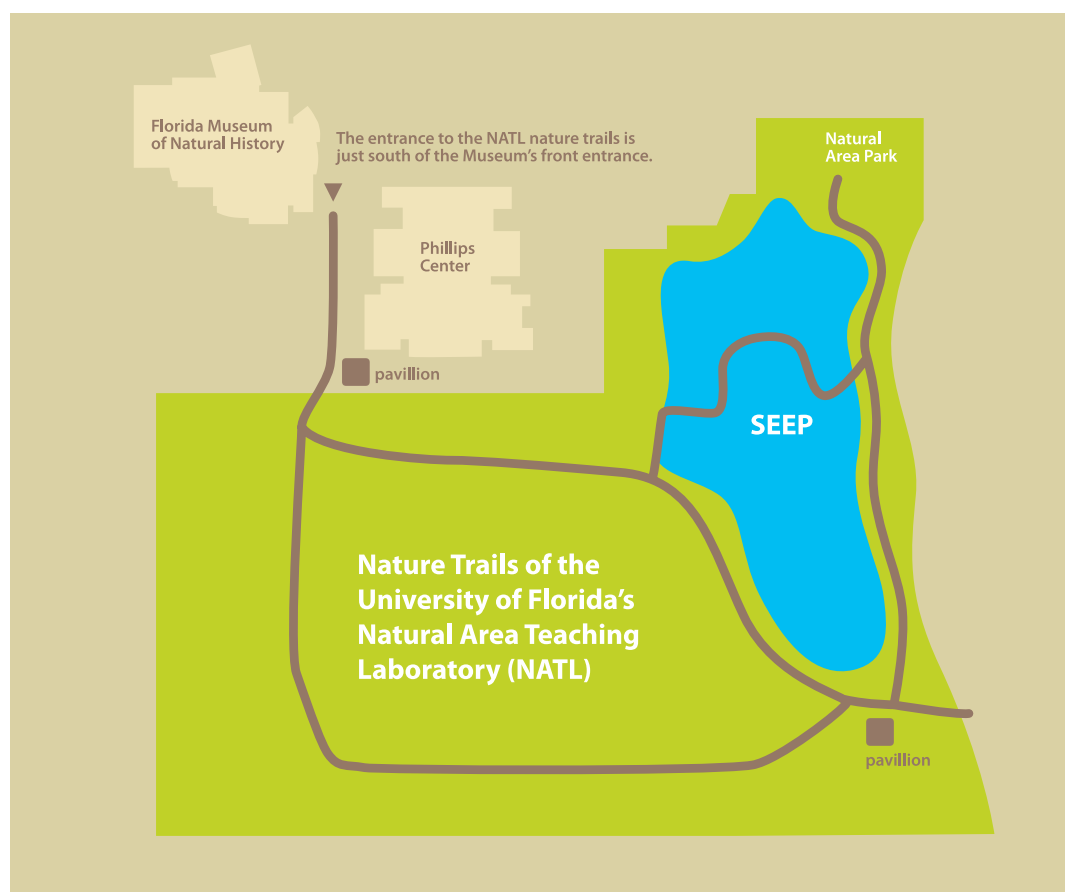
Permanent Exhibitions continued

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UF Natural Area Teaching Laboratory (NATL)

The University of Florida Natural Area Teaching Laboratory (NATL), adjacent to the Florida Museum, is dedicated to teaching students and the public about ecology and biotic diversity. It consists of 60 acres and has significant samples of three upland ecosystems characteristic of north peninsular Florida: hammock, upland pine, and old-field succession. It has a variety of wetland habitats, including a 9-acre marsh that drains into a pond, a sinkhole and a 3-acre ecologically engineered retention basin.

Visit natl.ifas.ufl.edu to read descriptions of each ecosystem and wetland habitat.



PART FOUR: RELATED EXHIBITIONS AND PROGRAMS



Florida Museum of Natural History

School and Outreach Programs

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Programs Overview

School groups include home schools and public, private and faith-based PreK-12 schools within a school district.

The Florida Museum of Natural History offers the following field trip opportunities for school groups:

Guided School Programs

Join our museum docents for hands-on classroom activities and interactive walks through our state-of-the-art exhibits and outdoor natural areas. Guided programs are offered Tuesday through Friday mornings, Oct. 7, 2008, through May 22, 2009. Programs fill quickly, especially for the months of October, November, April and May. To avoid disappointment, reserve your date as early in the school year as possible. Reservations must be made a minimum of three weeks in advance of the program date.

http://www.flmnh.ufl.edu/education/guided_programs.htm

Indoor Programming

- 10-60 students per program
- Each program is 60 minutes in length
- \$3 student, 1/10 ratio chaperone free, additional chaperones \$3/each
- Butterfly-focused programs will have additional entry fee into the Rainforest
- Programs will work with grades pre-school to 12th grade. Each program will be individualized to provide age-appropriate activities

Indoor Program Options:

- Butterfly and Moth Explorations
- Fossils - No Bones About It!
- Trails in Time - Florida's Indian Peoples
- Waterways and Wildlife of Florida

Outdoor Programming

- 10-40 students per program
- Each program is 60 minutes in length
- \$3 student, 1/10 ratio chaperone free, additional chaperones \$3/each
- Outdoor Programs are available for pre-school through 5th grade students only

Outdoor Program Options:

- Eye on Insects - Fall Only
- Green Machine - Spring Only
- Stayin' Alive



PART FOUR: RELATED EXHIBITIONS AND PROGRAMS

Florida Museum of Natural History

School and Outreach Programs continued

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Self-Guided Visits

Suitable for groups that prefer to visit the museum without the benefit of docents or staff. Reservations are required for all self-guided visits of 10 or more students to ensure a positive experience for your group. Self-guided visits must be reserved at least two weeks in advance and are available Monday through Friday during Museum hours. A staff member will greet your group and facilitate the purchase of any tickets before you enter the Museum. After that, your group leaders are entirely responsible for the educational experience of the students.

http://www.flmnh.ufl.edu/education/self_guided.htm

Outreach – Inquiry Boxes

The Florida Museum of Natural History currently offers five Inquiry Box outreach programs for use in your classroom. They are also a great way to compliment your docent-led program or self-guided field trip to the Museum. Our Inquiry Boxes are correlated to the Sunshine State Standards and are designed to enhance FCAT preparation.

Each Inquiry Box contains selected natural history objects, games, a video, reference materials and a teacher's guide. Classroom teachers at any grade level may check out the Inquiry Boxes at a cost of \$25/box for a two-week period. Teachers will be responsible for the pick-up and return of the Inquiry Boxes to and from museum. If interested, please contact tours@flmnh.ufl.edu.

- Florida's Butterflies and Moths - grades K-4
- Florida's Reptiles and Amphibians - grades 2-6
- Northern Florida's Early Native People - grades 4-8
- Southern Florida's Early Native People - grades 4-8
- Florida's Seminole People - grades 2-6

Coming Soon!

- Florida's Fossils - grades 5-8
- The Geology of Florida - grades 5-8

http://www.flmnh.ufl.edu/education/inquiry_boxes.htm

PART FOUR: RELATED EXHIBITIONS AND PROGRAMS



Florida Museum of Natural History

General Visitor Programs and Special Events

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Programs for Children and Adults

The Florida Museum offers a wide variety of educational programming for visitors of all ages. These programs include summer and spring break camps, adult workshops and classes, field trips, lectures, weekend and school holiday classes for kids, and a preschool program for tots and parents. Programming for the general public also includes annual and special events such as Collector's Day, Museum Nights, Butterfly Fest, Earth Day, and Family Days at each exhibit opening.

Discovery Room

Swim through the shallows of a coral reef, puzzle together a prairie and create creatures from Florida's diverse ecosystems in our self-guided discovery stations. Visit our hands-on Discovery Room filled with activities and join us during scheduled program times for stories, puppets, Museum exploration with Dr. Discovery and more! To utilize the Discovery Room, groups must have one adult chaperone for every 5 students. The Discovery Room attendant reserves the right to limit the number of room participants or ask visitors to leave.

<http://www.flmnh.ufl.edu/education/>

PART FIVE: MUSEUM EXHIBITS MAP



Florida Museum of Natural History

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