



ACTIVITY GUIDE FOR TEACHERS



Foreword

“There are no other Everglades in the world.” Those were the words of Marjory Stoneman Douglas in 1947. Everglades National Park became the first national park set aside specifically to protect a unique diversity of plants and animals. More recently, the United Nations has recognized the area as an International Biosphere Reserve and a World Heritage Site. Its 1,509,000 acres of wild land are the subject of heated debate in one of, if not the most, threatened national parks. Additional information about Everglades can be found on our web site at <http://www.nps.gov/ever>.

Many of the threats facing the South Florida national parks originate outside their borders. Humans have had a greater impact on the parks than any other species. While there are grave concerns facing the parks, there is also a great deal of hope. The greatest hope for the future of our national parks is our children. As resource users and future decision-makers, the fate of the parks lies in their hands. This guide will help educators teach their students about exotic plants and animals occurring in the park and hopefully lead the students to responsible actions they can take to ensure the parks’ survival.

Over the years, a myriad of people have contributed to the development of the curriculum materials found in this guide. This guide would not exist without the support and help of all the teachers, students, parents, volunteers, and park staff who have participated in the parks’ programs over the past thirty years. This activity guide is dedicated to them.

If you have any comments or suggestions for the next edition, please contact the Environmental Education Office at (305) 242-7753, or write to:

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Acknowledgements

**This guide is dedicated to those teachers
who share their sense of wonder with their students.**

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Special thanks to Miami Dade County Public School Teachers and Everglades National Park staff who contributed to the first edition of the “Don’t Let It Loose Teacher Activity Guide.” Additional thanks to those who made suggestions and reviewed portions of this revision: Skip Snow, Jonathan Taylor, David Szymanski, Sonny Bass and Cherry Payne.

Special Thanks

The activities in this guide have been developed by teachers, and park rangers who have participated in Everglades National Park’s Environmental Education Program during the past thirty years. This guide could not have been produced without their contributions.

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An Introduction to Using This Guide

For over thirty years, Everglades National Park has cooperated with schools from surrounding counties to conduct a dynamic education program. Starting with a few trips to the park in 1970, the formal program has evolved into an effort, which touches more than 15,000 teachers and students annually.

This new guide is designed to help teachers conduct lessons on threats to the park. We have also added the Florida Sunshine State Standard(s) for each activity, a background information section, and blackline masters. While targeted specifically towards fifth through eighth graders, many of the activities can be readily adapted for other grade levels.

Everglades National Park is presenting this guide as a resource for teachers. It reflects our growing concerns for exotic species invading the park. It is our goal to:

1. Acquaint students with threats to Everglades/South Florida ecosystem through hands on interactive activities.
2. Develop within the students an understanding of the impact of invasive species to the Everglades and South Florida.
3. Direct students towards a status of active thinking and, hopefully, active participation relating to the introduction of invasive species.

The individual activities were selected to meet Florida Sunshine State Standards and the curriculum of Miami-Dade County Public Schools. Other school systems will find that most of the activities can readily fit into their science objectives for grades fifth through eighth. An interdisciplinary approach was taken when creating the guide so that materials can be easily integrated into varied school and subject skill areas.

An Overview of the Sections

This guide has been divided into six sections. The activities that are found in section two of this guide can easily be integrated into other activities that are available in other activity guides.

Background Information: This section contains information about the exotic species that are found in Everglades National Park. Only 26 exotic species are covered in this guide. These exotics are considered the most troublesome. This section can be used by the students for information before activities.

Activities: In this section six activities can be found that concentrate on how exotics are harmful to Everglades National Park. These activities will help students understand exotic species and how they affect the Everglades ecosystem. They will analyze the components of the Everglades natural environment, discover how those components are interrelated, understand threats to the food chain from exotic species and make recommendations for future control.

Supplementary Activities: This section contains additional classroom materials, activities, and drawings the teacher may wish to use to reinforce student learning retention.

Vocabulary: This section has a list of words and their definitions which may be used as a reference throughout the study of the exotics found in Everglades/South Florida.

Resources: This section contains a list of web resources that can be used by both teachers and students as well as a list of ways that students can help to combat exotic species.

Pre-test/Post-test: This section contains a test for students that can be taken before the activities to find out what they may already know about exotic species and taken again afterwards to see how much information they learned on exotics. Also included in this section is the “Don’t Let It Loose Pledge” which students are encouraged to sign once they have completed this study of the invasive species in the park.

Organization of Individual Activities

Each activity begins with an overview which contains; **subject matter, duration, location, key vocabulary, related activities** and the **Florida Sunshine State Standard(s)** which that activity meets.

Following the overview are **instructional objectives, method, background information, materials needed, procedure**, an **evaluation** section, and in some cases an **extension** activity is listed. The instructor is encouraged to maximize student critical thinking and creativity in each activity. Blackline masters are provided for many of the activities.

Activity Guide Evaluation Form

Educators are asked to complete and return the Activity Guide Evaluation Form on page VI. Completion of the evaluation form will help us improve future editions.

Exotic Species List

Plants

1. Melaleuca, *Melaleuca quinquenervia*
2. Brazilian Pepper, *Schinus terebinthifolius*
3. Australian Pine, *Casuarina equisetifolia*
4. LatherLeaf, *Colubrina asiatica*
5. Seaside Mahoe, *Thespesia populnea*
6. Lygodium, *Lygodium microphyllum*

Mammals

7. Feral Cats and Dogs, *Canis familiaris* and *Felis catus*
8. Feral Pig, *Sus scrofa*
9. Nine-Banded Armadillo, *Dasyus novemcinctus*
10. Gambian Pouch Rat, *Cricetomys gambianus*

Birds

11. European Starling, *Sturnus vulgaris*
12. Monk Parakeet, *Myiopsitta monachus*
13. Myna Bird, *Acridotheres* spp.

Amphibians

14. Cuban Treefrog, *Osteopilus septentrionalis*

Reptiles

15. Brown Anole, *Anolis sagrei*
16. Indo-Pacific Gecko, *Hemidactylus garnotii*
17. Green Iguana, *Iguana iguana*
18. Burmese Python, *Python molurus bivittatus*

Insects

19. Fire Ants, *Solenopsis invicta*
20. Bromeliad Weevil, *Metamasius callizona*

Fish

21. Asian Swamp Eel, *Monopterus albus*
22. Walking Catfish, *Clarias batrachus*
23. Blue Tilapia, *Oreochromis aureus*
24. Oscar, *Astronotus ocellatus*
25. Mayan Cichlid, *Cichlasoma urophthalmus*
26. Pike Killifish, *Belonesox belizanus*

Exotic Species Background Information

Native trees, such as mangroves and cypress, are being replaced by exotic (introduced) species from other countries. Melaleuca, Australian pine, and Brazilian pepper are all serious problems in Everglades National Park. Florida largemouth bass share their nesting beds with tilapia and oscars, fish imported from Africa and South America. To date, there are 140 exotic plant species found in Everglades National Park in addition to the 342 exotic animal species.

The introduction of exotic animals and plants into South Florida began in the late 1800s and has escalated ever since. These newcomers were originally introduced as pets, food sources, ornamentals, or as biological controls. Because these species have few limiting factors in their new home, their numbers often become unmanageable. Exotic species often displace native flora and fauna by competing with them for space and food. Most exotics are extremely difficult to eradicate.

Many non-native animals have also been detrimental to the natural habitat of South Florida. In misguided acts of mercy, citizens have turned loose their no longer wanted pets in what they consider a “good home.” Parakeets, parrots, and other unwelcome animals have been observed in Everglades National Park. Feral hogs have also increased in numbers. Their digging disrupts native vegetation and important archaeological sites.

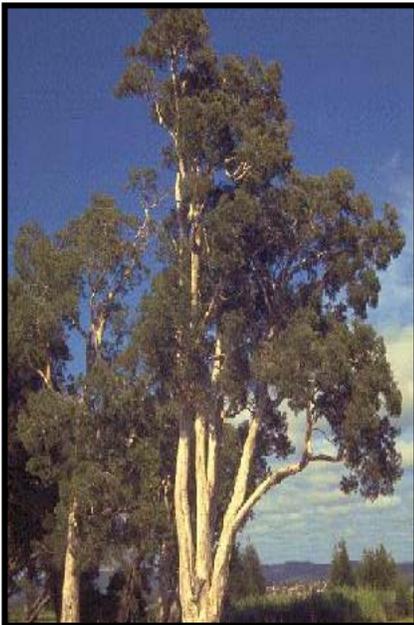
Blue and spotted tilapias, oscars, and Mayan cichlids, exotic fish which have invaded the Everglades, pose a threat to native fish populations through predation and competition for nesting sites. Eradication of these fish is close to impossible, and no effective control method has yet been found.

PLANT PESTS

Brazilian Pepper, *Schinus terebinthifolius*

(Also known as Florida Holly)

This plant is from the coast of Brazil and was introduced as a decorative plant. This plant grows quickly and can easily take over an area. The berries that grow on it are eaten by raccoons and birds, which then defecate the seeds. The seeds grow quickly in that new area and eventually take over. Brazilian pepper competes with native plants for light, soil nutrients, and moisture. Eventually the native trees die because they are unable to survive. Brazilian pepper also releases a chemical from its leaves, which stops the growth of native plants.



Melaleuca, *Melaleuca quinquenervia*

(Also known as “Paper-bark” or “Punk Tree”)

This plant was introduced from Australia as an ornamental plant and to help dry the Everglades in the early 1900s. Melaleuca is an aggressive invader that can grow in almost any habitat, such as sawgrass marshes, wet prairies and sloughs. Melaleuca turns these habitats into dense forests that almost nothing can get through. In one year, one tree can reproduce enough to create a melaleuca forest that is 600 feet in diameter (across). A mature tree can produce more than one million seeds per year and store an estimated 20 million seeds. Both wind and water can disperse these seeds. This is a true terror in the Everglades. Melaleuca is very dangerous for the sawgrass prairies. The trees can quickly dry up an area because melaleuca trees use 4 to 5 times more water than sawgrass. There are now several million acres of melaleuca forests in the Everglades ecosystem and no easy way to get rid of them. Any disturbance (fire, drought, and herbicide) to the tree causes it to release its millions of seeds.

Australian Pine, *Casuarina equisetifolia*

(Also known as “Iron Wood”)

This plant was introduced from Australia in the 1800s for ditch and canal stabilization, lumber, and shade. Since then the trees have spread rapidly because of their ability to flower all year and their seeds are dispersed by wind. The pine is fast growing (5-10 feet per year) and quickly produces a dense, shady area covered in a thick layer of pine needles. Because of this the ground below a stand of trees becomes sterile and no longer provides food for native wildlife. The stands of trees also displace native plants that grow on dunes and beaches, which include mangroves. When the trees blow over during storms, they also increase the erosion of dunes, which interferes with nesting of endangered sea turtles. By changing the light, temperature, and soil chemistry of an area, the Australian pine displaces native plants and destroys habitats for native animals.



LatherLeaf, *Colubrina asiatica*

This Asian plant was brought to Jamaica in the 1850s and from there spread to Florida, probably by hurricanes or high winds. Latherleaf grows quickly and produces a thick mat of tangled vines that can be several feet thick. The thick mass of vines then destroys any native plants on the ground by blocking the sun. This plant's habitat of preference is the coastal hardwood forests. This habitat is unique and has several rare species, many of which are listed as threatened or endangered. LatherLeaf destroys ideal habitat for native wildlife and interferes with the water and nutrient cycles.



Seaside Mahoe, *Thespesia populnea*

This plant was introduced as a salt and drought tolerant tree for decoration in yards and gardens. Seaside mahoe grows on shorelines and forms dense stands that nothing is able to get through. It crowds and shades out native vegetation, keeping it from growing. The fruit are able to float which enables this plant to spread to islands off shore.



Old World Climbing Fern, *Lygodium microphyllum*

This fern was introduced to Florida in the 1960s as an ornamental plant. Since then the plant has spread and now affects about 39,000 acres in Florida (as of 1997). This is a climbing fern that forms dense thickets that can grow to cover trees, eventually smothering them, and eventually entire forests! They also form mats on forest floors that can be up to 4 feet deep. These thick mats can prevent any new plants from growing in a forest. The roots also alter the flow of water in streams and wetlands. Because the ferns climb so high, they also create a fire danger. The ferns burn easily and can take a small, low fire high into the canopy of a forest, completely killing all the trees. This plant can also cause a fire to burn into flooded cypress swamps where normally a fire wouldn't burn. This is an aggressive species that will likely spread further.

ANIMAL PESTS

Monk Parakeet, *Myiopsitta monachus* (Also known as “Quaker Parakeet”)

Florida has the largest population of monk parakeets in the United States. Introduced from South America, Florida now has an estimated population of 50,000 to 150,000 birds over a range of 52 counties. These birds are mainly found in urban areas. The monk parakeet rarely affects native birds since they tend to stay in urban areas, but they have been seen killing robins and blue jays. The monk parakeet could impact native birds since native birds need every advantage they can get in urban areas. If native birds are already stressed in an urban area, the addition of the monk parakeet could cause more problems. Population biology predicts that monk populations will increase in size and their range will spread beyond the urban areas. If this happens, the monk parakeet could cause damage to agricultural fields like they have in Argentina. Monk parakeets also damage transmission lines by causing them to short circuit.



Myna Birds, *Acridotheres spp.* (Also known as “Indian myna” or “House myna”)

Florida has at least 3 different species of myna birds: Crested myna, Common myna, and the Jungle Myna. The myna birds are originally from southeastern Asia. They have been introduced into almost every tropical or subtropical area of the world. In Florida, the populations tend to stay in human developed areas, like shopping mall parking lots. The myna birds may nest in cavities or as large groups in trees, taking away nesting sites from native birds. They also attack purple martins and take over the purple martin houses that Floridians build. The myna bird population can grow quickly and since they are omnivores (eating both plants and animals) they can also become a serious pest of agricultural fields. They can end up eating not only the fruits in orchards, but also the insects, which pollinate the plants. The myna birds have also been known to carry bird malaria, which can spread to people.

European Starling, *Sturnus vulgaris* (Also known as the “Common starling” or “English starling”)

A man who wanted all the birds mentioned in William Shakespeare’s works to be found in the United States introduced the starling in New York City in 1890. All 200 million starlings now found in this country are from the first 80-100 birds released. The starling was not seen in Florida before 1950, but is now found statewide. They potentially hurt native bird populations by displacing a number of native cavity-nesters. Starlings travel in large flocks that can total well over 1000, and can damage the trees they roost on. The flocks are also so noisy that most people find them disturbing. The large amount of droppings that these flocks leave behind can damage vehicles and structures where the birds are present. Large numbers of starlings in agricultural areas will also cause significant damage to livestock feed, stored grain and fruit crops. They can also spread diseases to livestock, causing another problem and loss of money for agriculture. The starlings can also cause health-related problems in humans through the transmission of parasites and pests.





Burmese Python, *Python molurus bivittatus*

This snake is originally found in Southeast Asia. It is a popular snake to have as a pet, but some people release the snake into the wild when it outgrows its welcome. The Burmese python has been reported in South Florida since the 1980s. Breeding in the wild in South Florida has been suspected since the mid-1990s. This snake will prey on reptiles, amphibians and fish, but primarily eats mammals and birds. Since it is so large (up to 24'), it can threaten a large variety of animals, including endangered species. Biologists have been examining captured pythons to see

what they have been eating in the wild. From the stomach contents, scientists have found the remains of white ibis, marsh rabbits, squirrels, cotton rats, raccoons, pie-billed grebes and limpkins. By eating these native animals, pythons are competing with native predators like the bobcat. Alligators have been observed eating pythons and may help control this snake.

Green Iguana, *Iguana iguana*

This lizard is a native of Central and South America. It is a very popular pet but it often escapes or is released by people who cannot care for it anymore. The iguana rarely survives in the wild except in extreme southern Florida. This reptile can now be found on Key Biscayne and in urban areas. It isn't known what problems the iguana can cause on native species. Adult iguanas are herbivores, so they do not compete for food with our native lizards. Due to their voracious appetite, they can be a significant pest around gardens and landscape plantings.



Cuban Brown Anole, *Anolis sagrei*

The brown anole is native to Cuba and the Bahamas. It was first seen in the Florida Keys in 1887 and arrived in South Florida during the 1940s. Ships carrying merchandise from Cuba probably transported this species here. This anole is the most abundant in South Florida and populations can be found in every county in Florida. The brown anole is responsible for decreasing the native green anole populations. The brown anole takes over ideal habitat for the green anole and male brown anoles prey upon the smaller green anoles.

Indo-Pacific Gecko, *Hemidactylus garnotii*

This gecko is native to southeastern Asia and many South Sea Islands. It can now be found in many urban areas of South Florida and also in natural habitats such as mangrove forests, sand pine scrub and pine rocklands. Out of the 7 introduced gecko species, this one has the widest range in Florida. The gecko is expanding its range rapidly. One of the reasons it could be expanding so quickly is through shipments of palm trees. Although this gecko has a large range and is established through most of south Florida, no one knows what impacts it may have on native species.





Blue Tilapia, *Oreochromis aureus*

This species was introduced into Florida through fish farm releases and by the state for weed control. Originally from Africa, they are now widely spread through Florida and have large local populations. They have a high tolerance to cold, which gives them the ability to survive in much of the Florida peninsula. Blue tilapia are one of the most common exotic fish in South Florida waters. Tilapia are responsible for the lower numbers in shad populations in Central Florida and they compete with other fishes for breeding areas and food. Their aggressive behavior also changes the native community structure where tilapia occur in large numbers. Tilapia feed on algae and detritus. The species has been successful because the males mate

with many females. The female protects eggs and young by carrying them in the mouth, known as *mouth brooding*.

Pike Killifish, *Belonesox belizanus*

Pike killifish are originally from Central America and were introduced into a Miami canal in 1957 after a research project ended. They are now found throughout South Florida in shallow fresh waters and in mangrove swamps. They can tolerate water that is low in oxygen, which gives them an advantage over many of the native fish species. The populations of pike killifish continue to spread. They prey on native fishes, particularly mosquitofish. Pike killifish are locally common in mangroves and marsh communities. They are actually viviparous fish that give birth to live young.



Oscar, *Astronotus ocellatus*

This species, originally from South America, was purposely introduced in the 1950s by a fish farm. Since then, they have spread throughout South Florida. The oscar has become one of the most popular sport fishes in southern Florida. Large populations of oscar can commonly be found in canal habitats and in the Water Conservation Areas. The extent of impact that the oscar has on native fishes isn't known. However, the oscar is known to prey on native fishes and invertebrates. It is aggressive and may affect native fish nesting by using the same habitats for breeding.

Walking Catfish, *Clarias batrachus*

This species comes from Southeast Asia and was introduced by an accidental release from a fish farm into South Florida waters. The range of the catfish has grown throughout Florida because of its ability to ‘walk’ on land using its fins to move. It is a predator that feeds opportunistically on aquatic and terrestrial prey. During the dry season, when fish are congregated into small pools, the catfish can quickly consume other fishes to become the major surviving species. They are also able to breathe atmospheric oxygen, making



them better equipped to survive the dry season than many native fish. Walking catfish have also been known to kill largemouth bass without eating them. The walking catfish has spread throughout the southern 2/3 of the Florida peninsula. It typically nests in cavities at the beginning of the wet season.



Mayan Cichlid, *Cichlasoma urophthalmus*

It isn't known how this fish from Central America was introduced into Florida, but it has now spread throughout South Florida and is one of the most common non-native fish. It has expanded its range because of its varied diet and tolerance to low oxygen levels and variations in salinity. The Mayan cichlid has been shown to alter community structure because of its aggressiveness and predation. It competes with native fishes for breeding grounds. While the Mayan Cichlid preys upon the juveniles of native sport fish such as tarpon and snook, they are, in turn, eaten by these popular species.



Asian Swamp Eel, *Monopterus albus*

The swamp eel originated from Asia and was possibly introduced into South Florida by food-fish trade. In Asia, this species is a source of food and is commonly sold in markets. It is not known what impact this species will have in South Florida, but it has the potential to act as a predator of native aquatic species. This eel can also adapt to many aquatic environments and can potentially survive under conditions inhospitable to many native fish. The eels breathe atmospheric oxygen which enables them to move across land during rains, and exhibit sex change as they grow. There have been at least three separate introductions in South Florida.



Bromeliad Weevil, *Metamasius callizona*

(Also known as “Mexican weevil” or “evil weevil”)

This insect was introduced from Mexico on shipments of bromeliads. The weevil quickly spread and as of 2000 it was present in 17 counties in South Florida. The larva of this species drills into the leaves of bromeliads, eventually killing them. Two more species of bromeliads have been listed as endangered because of the weevil. The weevil is also present in the Everglades, where a large population of rare bromeliads exists. This insect also attacks plants in private nurseries and collections, causing a loss of money for the owners. The weevil is able to spread quickly through south Florida due to a lack of any natural predators.

Fire Ant, *Solenopsis invicta*

Fire ants are believed to have been introduced to the United States sometime between 1933 and 1945. They were more than likely brought in on plants or other imports. Fire ants first appeared in Texas and quickly spread throughout the South. Fire ants are capable of spreading much more rapidly than native ants because they have adaptations that enable them to survive during both droughts and floods. They are also much more aggressive than native ants and have a painful sting. When their nest is disturbed, they swarm and as a group, injecting their venom at the exact same time! Even though the bites aren't bad enough to kill most people, they can kill small animals such as mice or birds. They sometimes even kill newborn calves if the calves don't stand up fast enough. They are so aggressive that they can easily clear out all the invertebrates (animals without backbones...like insects), lizards and ground-dwelling birds. Besides their aggressiveness, the ants are also damaging to crops. Their mound (nest) building can damage the roots of crops, causing money loss for farmers. They can also kill bees, which pollinate our citrus trees. The ants are also attracted to electrical fields and crawl into air conditioners and wiring of traffic lights, causing them to short out. These ants have become a major problem and current research is leading the way for the introduction of its natural enemies.



Cuban Treefrog, *Osteopilus septentrionalis*

This frog is a large species of tree frog from the West Indies. It was probably brought to Florida in the 1950s through shipments of plants. They are normally found in human-altered habitats, like gardens or nurseries, but can also be found in some natural wooded areas. The Cuban treefrog is a carnivore and feeds on invertebrates (such as insects) but it also feeds on the smaller native treefrogs like the green and squirrel treefrogs. It can also interfere with the breeding of the native frogs and the growth of the tadpoles. They are capable of reducing the populations of native frogs through predation (feeding) and competition. Their skin also releases secretions that make them inedible for many birds and snakes, so they are lacking predators.

Nine-banded Armadillo, *Dasypus novemcinctus*

The armadillo expanded its range from the southwest to include northern Florida, but several were also introduced to the East Coast of Florida in the 1920s. Today, the armadillo ranges throughout the state. It isn't known what impact this species will have in Florida, but it may harm populations of native reptiles and amphibians since armadillos feed on their young. This could cause problems for native species that are already stressed from other exotic species. Armadillos can also be a nuisance because they tend to dig up lawns looking for food. They carry dangerous diseases like encephalitis and leprosy. Because they are such skilled diggers, armadillos are even capable of damaging archeological sites.



Gambian Pouch Rat, *Cricetomys gambianus*

Not much is known about the status of this large African rodent in Florida. The Gambian Pouch Rat was first found on Grassy Key in 2002. It is believed that the current population is the progeny of only a half dozen released in the area between 2000 and 2002. Since its discovery, importation of this mammal has been banned. The Gambian pouch rat can weight up to 9 pounds and be the size of a raccoon. This rodent is an omnivore and, if it escapes or expands its range past Grassy Key, could compete with native birds and mammals, including the endangered Key Largo wood rat. These rodents are so large that they don't have any natural predators in the

Keys. They will be able to quickly reproduce and spread through an area. The rats are able to have up to 5 litters every 9 months with 4 babies in each litter. That's 20 babies per female every 9 months! The pouch rat can also eat the fruits of many plants and prevent the seeds from spreading. They are also believed to be responsible for a monkey pox outbreak.

Feral Pig, *Sus scrofa*

(Also know as "wild hogs" or "wild pig")

Feral pigs were introduced in Florida starting with the early colonists, and have now spread across all counties in Florida. They have since become a game animal for hunters as well as a food source for panthers, black bear, and alligator. But they cause serious problems for native plants by rooting around and destroying roots. This behavior can also damage valuable and irreplaceable archeological sites. Feral pigs also feed on sea turtles, gopher tortoises, and shorebirds. They carry Trichinosis and have transmitted this disease to some panthers. They can also transmit diseases to livestock, causing a loss of money for farmers.





Feral Cats and Dogs, *Canis familiaris* and *Felis catus*

Feral cats and dogs are pets that were released or abandoned and are now living in the wild. Both appeared in Florida during colonial times or earlier. Many of these animals are now living in packs and breeding. The feral dogs have become predators of many native animals in Florida, including deer and rabbits. They are also carriers of rabies and can cause problems for livestock. Dogs have been known to attack sheep and calves in other parts of the country. Feral cats prey on native birds, small mammals, amphibians, and reptiles. Cats are very efficient predators and may be the cause of the decline in beach mouse populations in Florida. They have also spread feline panleucopenia virus into the native panther and bobcat populations and can transmit rabies.

Meet Python Pete

Meet Python Pete, a little beagle puppy with a big job; helping remove exotic Burmese pythons from Everglades National Park. Lori Oberhofer, an Everglades wildlife technician, purchased Pete when he was 8 weeks old. Since then he's been going through a tough training regimen.



Twice a week, Pete is trained to track pythons. His trainer, Oberhofer, puts a live python in a mesh bag and drags it through some grass, creating a scented path for Pete to follow. At the end of the trail, she leaves the snake in the bag and Pete's favorite toy. Oberhofer then puts Pete into a special harness and tells him to, "Find it!" Pete then charges ahead to find the snake and his favorite toy that's hidden in the grass. So far, Pete has been successful on every trial. "He does very well on each trial and always brings me to the snake," Oberhofer said. "He continues to show improvement every time we take him out to train. It hasn't taken him long to figure out that smelling a python means playtime."



Don't worry though, every time Pete goes out hunting pythons, he will be wearing his safety harness. This will keep him safe from hungry alligators and pythons.

Lori Oberhofer got the idea of using a beagle to sniff out pythons from a program in Guam. While she was there researching brown tree snakes, she learned that U.S. Department of Agriculture officials use Jack Russell terriers to detect tree snakes in airport cargo.

Since pythons are a big problem in the Everglades, Oberhofer decided to train her puppy to help track them down. These giant pythons are breeding in the Everglades and threatening the native wildlife in the park. They may be preying on endangered species and taking over habitat of the threatened indigo snake. Visitors have even witnessed pythons battling with alligators.

From the mid-1990s through 2003, park officials removed 52 pythons from the park. In 2004, 61 pythons were removed. So it's obvious that the problem is getting worse. But there is hope in the form of a little pooch named Python Pete!

Unwanted Guest

Subject: Science

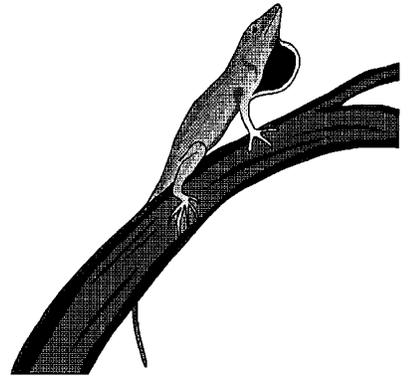
Duration: 30-45 minutes

Location: Classroom

Vocabulary: Exotic Species, Native Species

Related Activities: Go Back Home, Population Explosion, Break the Chain, Going...Going...Gone!, Everglades "Most Wanted," Fishy Business

Florida Sunshine State Standards: SC.D.2.2, S.C.G.1.2, SC.G.2.2, SS.B.2.2



Objectives. The students will be able to 1) define exotic species and list at least four, 2) define native species.

Method. Students will play a "guess who" game with native and exotic species found in Everglades National Park.

Background. Everglades is home to many species of animals, fifteen of which are considered endangered. The invasion of exotic species is a threat to native species. Removing exotics from the Everglades is expensive and not always successful.

Suggested Procedure

1. Have students review the plant and animal pest list and pictures.
2. Pin a photograph of an exotic or native species to each student's back without the student knowing what it is. Indicate to the student whether the species is exotic or native.
3. Instruct the students to mingle around the room asking their classmates five to ten "yes or no" questions about their species. The students can only ask each student one question. After they have asked a question they must move on to another student.
4. After students have asked their questions have them form a semi-circle so all can see. Choose one species and stand those children wearing that species card so that their backs are facing the group. Do not disclose the name of the species.
5. The students wearing the photo cards should tell the group as many things as they can about their species, including what species they think they are. If the students guess incorrectly, have the class help by describing some of the species' characteristics.
6. Repeat until all students have described their species.
7. After students have described their species, have them separate into 2 groups. One group should be exotic species and the other one should be native species.

Materials

- Laminated photo cards of native and exotic species
- Safety Pins

8. Once students are separated into the correct groups, have the students with an exotic species card locate the native species that they impact the most.

Evaluation

Discuss how exotic species impact native species. What can be done about this problem?

Extension

Have students research an exotic animal or plant in the Everglades.

Have students create a diorama of a habitat and how exotic species can impact it.

Go Back Home

Subject: Science

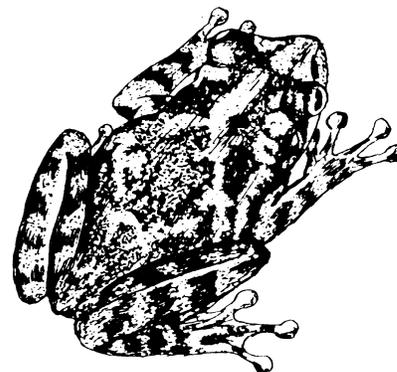
Duration: 30-45 minutes

Location: Outdoors

Key Vocabulary: Food chain, exotic, native, habitat, competition, producer, consumer, herbivore, omnivore, carnivore

Related Activities: Unwanted Guest, Population Explosion, Break the Chain, Going...Going...Gone!, Everglades "Most Wanted," Fishy Business

Florida Sunshine State Standards: SC.D.2.2, S.C.G.1.2, SC.G..2.2, SS.B.2.2



Objectives. The students will be able to 1) define a food chain and give at least one example of a food chain; 2) define exotic and native species and state at least one example of each; 3) explain how exotic species can harm native species.

Method. Students will play an active game depicting the interactions in a habitat and the problems that occur with exotic species introduction.

Background. The natural food chain within a habitat is finely tuned. For any species to survive within a habitat four components are needed: food, water, shelter, and space. Exotic species can take these components away from native species.

<p>Materials</p> <ul style="list-style-type: none">• 5 bases• Blackline Master - "Organism Cards"

Suggested Procedure

1. In an open area place bases equally apart. Instruct students to form a circle around the bases. Tell students that the each base represents a different habitat in South Florida. (i.e. one base is a mangrove estuary, another is a sawgrass marsh. To help clarify, small signs can be placed on or near each base so students know which habitat it is)
2. Pass out organism cards. Each student should have one with either a native or exotic species on it. Make sure that every component of a food chain is represented.
3. Have students walk quickly around bases while you play music or count to 10. When music or counting stops students must go to the nearest base (habitat). Only 4-6 students can stop at each base.
4. After students have settled at the bases ask them to read the information that is written on the back of each card. Based on that information, they must form a food chain. The food chain should have at least one producer, one herbivore, one carnivore and one exotic at each base. Note: Some exotics will compete for food and natives do not eat others. Make sure the students pay close attention.

5. Have each student who is an exotic raise his or her hand. Ask them what species they are and how they alter a habitat and the animals that are found within it. If a native species is affected, the student with that card is now out. Note: Some exotics destroy an entire habitat. When this happens all the other species that were on the base are now dead.
6. Record how many native species or habitats were destroyed by exotics.
7. Play another round. If any habitats were destroyed take that base away and those students that were native species must sit out. The student(s) that were exotics are able to continue since exotics are able to spread easily.
8. Once the music or counting stops repeat steps 4 through 6.
9. Continue for a total of 3 rounds or until all native species are gone.

Evaluation

Once the game is over ask the students what they think happened during the game. Were native species able to compete with the exotics? Did the exotics disrupt the food chain? How? What would this do to an ecosystem?

Organism Cards

<p>MAYAN CICHLID</p>	<ul style="list-style-type: none">• Exotic fish• Varied diet• High tolerance to salt water• Competes with native fish for food• Preys on young tarpon and snook• Very aggressive feeder
<p>WHITE TAILED DEER</p>	<ul style="list-style-type: none">• Native mammal• Herbivore• Browses mostly on grass and young plants• Primary food of panthers• Large alligators will prey on deer sometimes
<p>EUROPEAN STARLING</p>	<ul style="list-style-type: none">• Exotic bird• Travels in very large flocks• Can damage trees when flocks land on them• Spreads diseases
<p>BLUE TILAPIA</p>	<ul style="list-style-type: none">• Exotic fish• Tolerance to cold• Responsible for lower shad numbers• Compete with native fish for food• Competes with native fish for breeding grounds• Native fish don't prey on it
<p>CUBAN TREEFROG</p>	<ul style="list-style-type: none">• Exotic amphibian• Carnivore• Feeds on invertebrates• Eats smaller native tree frogs• Inedible for many snakes and birds
<p>WOODSTORK</p>	<ul style="list-style-type: none">• Native bird• Endangered species• Carnivore• Needs 3 ½ lbs. of fish per bird for young to survive.• Eats small fish only

Organism Cards

AUSTRALIAN PINE	<ul style="list-style-type: none">• Exotic plant• Sterilizes ground• Stops growth of food for herbivores• Displaces native plants that grow near salt water• Interferes with sea turtle nesting
SAWGRASS	<ul style="list-style-type: none">• Native plant• Covers 75% of fresh water habitat• Apple snails lay eggs on sawgrass stalks• Deer eat sawgrass• Main habitat for alligators, wading birds, apple snails
SABAL PALM	<ul style="list-style-type: none">• Native tree• Provides food for wildlife, like deer and bears• Provides shelter for birds and lizards• The bases of old fronds (boots) sticking out from trunk provides growing spots for ferns and bromeliads
LARGEMOUTH BASS	<ul style="list-style-type: none">• Native fish• Carnivore• Feed on smaller fish and invertebrates• Lay eggs in shallow nests• Found in all clear freshwater
SNOOK	<ul style="list-style-type: none">• Native fish• Species of special concern• Found in saltwater• Carnivore, feeds on small fish and crustaceans
PURPLE MARTIN	<ul style="list-style-type: none">• Native bird• Carnivore, eats insects (insectivore)• Uses manmade houses for breeding and raising young• Dependent on these houses for raising young

Organism Cards

<p>FLORIDA PANTHER</p>	<ul style="list-style-type: none"> • Native mammal • Endangered species • Carnivore, deer and hogs are preferred food • Lives in hammocks, pinelands, cypress swamps, sawgrass marshes • Not enough large prey at times
<p>GREEN TREEFROG</p>	<ul style="list-style-type: none"> • Native amphibian • Carnivore (small insects) • Found on plants near water • Found in most moist habitats
<p>BROMELIADS</p>	<ul style="list-style-type: none"> • Native plants • Water pockets formed by leaves provides habitats for treefrogs • Several species are endangered • Tend to grow on host trees with rough bark • Collects nutrients from the air
<p>MOSQUITO FISH</p>	<ul style="list-style-type: none"> • Native fish • Insectivore (eats insects) • Found in freshwater sloughs and rivers • Eat as many as 100 mosquito larva per day
<p>KEY LARGO WOODRAT</p>	<ul style="list-style-type: none"> • Native mammal • Endangered species • Omnivores • Dependent on diversity of tropical hardwood fruits • Found in only mature hammocks
<p>LEATHERBACK SEA TURTLE</p>	<ul style="list-style-type: none"> • Native reptile • Endangered species • Omnivore, feeds on jellyfish and algae • Found in saltwater • Largest living sea turtle • Builds nests on sandy beaches

Organism Cards

<p>BURMESE PYTHON</p>	<ul style="list-style-type: none"> • Exotic reptile • Reaches up to 26ft in length • Preys on medium to large mammals • Eats fish, mammals, reptiles, birds which threatens a large variety of animals • Has been known to eat wood storks, an endangered species
<p>MELALEUCA</p>	<ul style="list-style-type: none"> • Exotic tree • Grows in almost any habitat • Destroys habitats, turning them into melaleuca forests • Uses 4 to 5 times more water than sawgrass • Poor quality habitat for wildlife
<p>BROMELIAD WEEVIL</p>	<ul style="list-style-type: none"> • Exotic insect • Larva drills into the leaves of bromeliads • 2 species of bromeliads now endangered because of weevil • no natural predators
<p>NINE-BANDED ARMADILLO</p>	<ul style="list-style-type: none"> • Exotic mammal • Feeds on reptiles and amphibians • Digs up the roots of plants • Carry diseases
<p>LYGODIUM</p>	<ul style="list-style-type: none"> • Exotic plant • Climbing fern, covers the canopy of trees • Can cover an entire forest • Roots may alter the flow of water in wetlands • Increases chance of fire in cypress habitats
<p>APPLE SNAIL</p>	<ul style="list-style-type: none"> • Native invertebrate • Herbivore • Favorite food is periphyton • Major food source for endangered snail kite • Alligators and limpkins also eat snails

Organism Cards

<p style="text-align: center;">BALD CYPRESS</p>	<ul style="list-style-type: none"> • Native tree • Important plant species in Big Cypress National Preserve • Provides a place for native air plants to grow, including endangered ones • Provides roosting for birds
<p style="text-align: center;">BREAM</p>	<ul style="list-style-type: none"> • Native fish • Carnivore • Feeds on aquatic invertebrates, like young apple snails • Nest in shallow waters
<p style="text-align: center;">SEA GRAPE</p>	<ul style="list-style-type: none"> • Native tree • Grows in sandy areas near salt or brackish waters • Fruit provides food and shelter for wildlife • Many medicinal qualities
<p style="text-align: center;">ALLIGATOR</p>	<ul style="list-style-type: none"> • Native reptile • Carnivore • Main predator species in South Florida • Found in freshwater areas • Feeds on fish, mammals, reptiles
<p style="text-align: center;">CAPE SABLE SEASIDE SPARROW</p>	<ul style="list-style-type: none"> • Native bird • Endangered species • Most of the population is in Big Cypress Swamp and Taylor Slough (southern Everglades NP) • Changing water levels and vegetation disrupt nesting • Omnivore
<p style="text-align: center;">GREEN ANOLE</p>	<ul style="list-style-type: none"> • Native reptile • Carnivore (eats insects) • Southern green anole (subspecies) is found only in Florida • Only native anole in US • Population in decline

Organism Cards

<p>MARSH RABBIT</p>	<ul style="list-style-type: none">• Native mammal• Herbivore• Lower Keys Marsh Rabbit (subspecies) is endangered• Found in cypress swamps and sawgrass marshes
<p>FERAL CATS AND DOGS</p>	<ul style="list-style-type: none">• Exotic mammals• Preys on a large number of native species, including endangered and threatened species• Carnivores, feed on fish, reptiles, amphibians, and mammals
<p>PIKE KILLIFISH</p>	<ul style="list-style-type: none">• Exotic fish• Found in freshwater and some brackish• Carnivores, feeds on smaller fish and insects• Lower numbers of mosquito fish
<p>GAMBIAN POUCH RAT</p>	<ul style="list-style-type: none">• Exotic mammal• Omnivore• Large, up to 9 pounds• No natural predators• Found on the Florida Keys in hammocks
<p>INDIGO SNAKE</p>	<ul style="list-style-type: none">• Native reptile• Threatened species• Carnivore• Found in many habitats, but need a large range• Not many predators• Pythons are competing with for food and habitat
<p>POND APPLE</p>	<ul style="list-style-type: none">• Native tree• Produces fruit that is important for wildlife• Favorite food of giant sphinx moths

Going...Going...Gone!

Subject: Science

Duration: 30 minutes

Location: Classroom

Key Vocabulary: Native, Exotic, Endangered, Extinct, Competition, Alien

Related Activities: Unwanted Guest, Go Back Home, Fishy Business Break the Chain, Population Explosion, Everglades "Most Wanted"

Florida Sunshine State Standards: SC.D.2.2, S.C.G.1.2, SC.G.2.2, SS.B.2.2



Objectives. The students will be able to 1) define the terms native, alien, endangered and extinct; 2) explain the impact of exotic vegetation to natural communities; 3) name at least three native and three exotic species found in South Florida.

Method. The students will participate in an activity which mimics how wildlife populations are reduced by invasive alien species.

Background. People play a significant role in the movement of species around the world. While this distribution is sometimes accidental, certain industries (such as agriculture, horticulture and research) depend on the constant flow of new plants to areas around the globe. While the vast majority of these alien species remain in cultivation, the few that escape can become invasive and pose serious consequences to an ecosystem.

Of particular concern to South Florida are a number of alien plant species that threaten to overtake and displace native vegetation on a large scale. Melaleuca, Brazilian pepper, and Lygodium are but a few of the alien species that are capable of producing vast monocultures (communities comprised of only one species) over the landscape. These plants are able to successfully utilize limited resources to dominate natural communities. These invasions often result in a non-diverse monoculture that proves inhospitable to all but the heartiest of wildlife. The loss of these viable, healthy habitats continues to be problematic for a number of endangered species that depend on them, and may ultimately threaten them with extinction!

Suggested Procedure

1. Copy and cut the blackline masters into cards. Cut five strips of paper for each student.
2. Have students stand in a large circle. Tape the name of an animal or plant to their shirts (taken from the "I Am" blackline master). If there are more than 15 students in your class, some plants and/or animals may be used more than once. The plants and wildlife found on the blackline master "I Am" are all native species that are found in South Florida. Some are currently endangered.

Materials

- Blackline Masters - "I Am" and "Survival Factors"
- Tape
- 5 small slips of paper or poker chips for each student

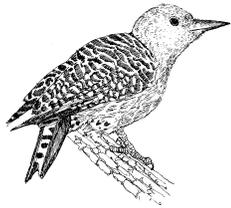
3. Distribute five pieces of paper to each student. Tell them that the papers represent a population of organisms. Review the population concept. Remind them that a population is all the organisms of a species found in a specific area; there are plant and animal populations; and the number of individuals determines the size of a population. The student populations are all the same size. Tell them that each slip of paper represents hundreds of organisms.
4. Tell the students that you will be reading some statements. Give them the following instructions:
 - a. Everyone stand up in a circle.
 - b. I am going to read some survival factors.
 - c. Each time I read a statement that limits or reduces your chances of survival put one of your slips on the floor in front of you.
 - d. Whenever I say, “new alien introduction”, everyone puts a slip down.
 - e. When you have two slips left, sit down on the floor and say, “I’m in big trouble!”
 - f. When you’re sitting, keep playing until you are out of slips completely.
5. Continue to play until everyone is sitting. Discuss the game, asking questions such as: “How many of you have slips left? How many have none? Is this game like what happens in nature? Why or why not? What are the important ideas about this game?”
6. Write the words EXTINCT and ENDANGERED on the chalkboard. Tell students that their populations became endangered when they became small in number. Endangered refers to any population of plants or animals in danger of extinction; there are still some left. The students who had two slips or less were endangered. Extinction is final; the plant or animal is “gone forever.” The students that lost all their slips became extinct.
7. Ask students to close their eyes and imagine a famous landmark like the Statue of Liberty being torn down or losing a favorite toy that was never found again. If they can imagine that, then they have some idea and feeling about extinction.
8. Tell students that because of the effects they’ve just demonstrated, there are a number of alien species that are illegal to own in Florida. Plants are placed on this list after careful study and review by many groups including the Florida Department of Environmental Protection, the Florida Department of Agriculture and Consumer Services, and the U.S. Department of Agriculture.

Evaluation

Summarize the lesson with a discussion. Use these kinds of questions:

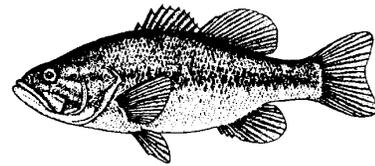
What are some of the factors that influence the survival of both native and alien species in South Florida? Can you think of some factors that this game did not consider? Does this game contain any facts? What are they? Are they accurate? How could you find out? Did populations have any choices? Why or why not? How could this game be changed to make it even more life-like? How would you change this game to have winners? (Does this game have any winners?) Do populations lose this game by chance?

I Am a Red-Cockaded Woodpecker



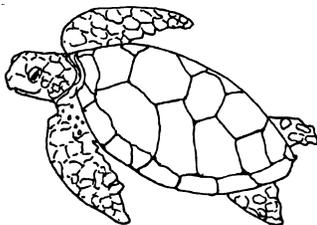
**I am endangered.
I nest in old, living pine trees.
I feed on native fruits and insects.**

I Am a Largemouth Bass



**As an adult, I live in open waters.
My babies hide in native aquatic plants.
I am very popular with fishermen.**

I Am a Loggerhead Sea Turtle



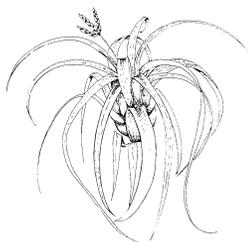
**I am endangered.
I live in the ocean.
I nest on the beach.**

I Am Sawgrass



**I grow in open, sunny environments.
I need lots of water to survive.
I am shelter to many animals.**

I Am a Cardinal Air Plant



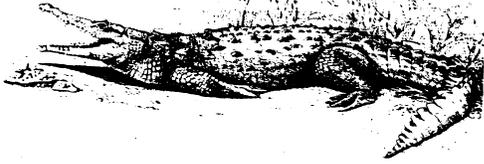
**I live on cypress trees.
I am a bromeliad.
I don't like shade.**

I Am a Fox Squirrel



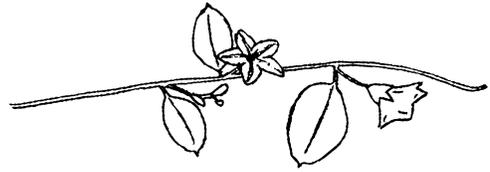
**I am endangered.
I live on cypress trees.
I sometimes nest in bromeliads.**

I Am an American Crocodile



**I am endangered.
I nest on the beach.
I need open areas to warm myself.
My young live among the mangroves.**

I Am a Pineland Jacquemontia



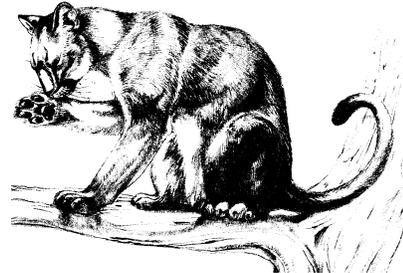
**I am a very rare plant.
I need sunlight to grow.
I live only in pinelands.**

I Am a Slash Pine



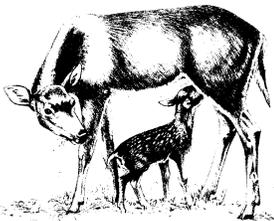
**I need sunlight to keep growing tall.
I need fire to keep me healthy.
Many animals use me as a home.**

I Am a Florida Panther



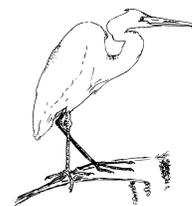
**I am endangered.
I stalk deer in open prairies.
I spend my days in cool hammocks.**

I Am a White-Tailed Deer



**I feed in open prairies.
I find shelter in hammocks and
pinelands.**

I Am a Great Egret



**I hunt in open waters.
I often nest in mangroves.
I spend lots of time in the sawgrass.**

I Am a Zebra Longwing



**I am an insect.
I feed on nectar from flowers.
I am Florida's state butterfly.**

I Am Periphyton



**I am a combination of alga.
I thrive in the shallow waters.
I grow around plants like sawgrass.
I need sunlight to live.**

I Am a Bladderwort



**I live in shallow water.
I need water to keep me healthy.
I need lots of sunlight to keep
growing.**

Survival Factors

A resident of Miami throws a strange plant from her fishpond into her backyard canal. The plant is water hyacinth and as it spreads, it shades sunlight from other submerged plants.

A tree called melaleuca grows uncontrollably and quickly converts open sawgrass prairies into a dense, closed forest.

Brazilian pepper is introduced and begins to grow and reproduce rapidly. These new invaders eventually shade out smaller plants.

A tiny weevil that was accidentally introduced during the importation of exotic air plants threatens the health of native bromeliads.

New alien introduction!

Australian pines planted as windbreaks along the coast grow thickly on the shore and prevent access to the beach.

Melaleuca continues to spread and takes over a wet cypress forest.

Hydrilla reproduces and spreads, crowding our shallow waterways and displacing other aquatic plants.

Because there is only so much money to go around, funds that fight the growth of exotic plants take away money from programs to save endangered species!

Survival Factors

A couple of Cuban tree frogs stow away aboard an imported palm tree. Upon arriving, they find a smorgasbord and begin to feed on insects!

The thick growth of both aquatic and terrestrial exotic plants in our canals and wetlands stymies the flow of much-needed water to the Everglades.

Old World climbing fern continues to spread along the coast and eventually covers a huge stand of mangrove trees.

The spread of alien species continues to reduce the number of native wildflowers.

New alien introduction!

Exotic fire ants that were accidentally introduced to South Florida in potted plants make their way to the beach, where they invade the nests of native wildlife.

Air potatoes release hundreds of bulbs which will sprout quickly into a thick tangle of climbing vines that can shade out tall trees and small plants.

Wildfire breaks out in an area that is infested with exotic plants. The growth is so thick, the fire climbs into the canopy of the tall trees.

Break the Chain

Subject: Science, Language Arts, Art

Duration: 2 Class Periods

Location: Classroom/Outdoors

Vocabulary: Competition, Food Chain, Exotic, Native

Related Activities: Everglades Most Wanted, Population Explosion, Unwanted Guest, Go Back Home, Going...Going...Gone!, Fishy Business

Florida Sunshine State Standards: SC.D.2.2, SC.G.1.2, LA.C.1.2, TH.E.1.2



Objectives. The students will be able to 1) define and give an example of a food chain. 2) Define exotic and native species and give examples of each. 3) Explain how an exotic species can harm native species or habitats.

Method. Students will act out a food chain with exotic species as a limiting factor.

Background. Have students read the species background information. The natural food web found within the Everglades is a complex system. Any change in this system can easily disrupt the web. This change causes a domino effect, causing problems for all species within the web.

Suggested Procedure

1. Assign students as the following species (this is only a suggestion; adjust numbers to fit the number of students in your class):
 - 1 human
 - 10 mosquitoes
 - 5 mosquito fish
 - 1 great blue heron
 - 1 snowy egret
 - 2 pike killfish
2. Have students make the items used to represent their species. (Example: student makes an egret beak out of construction paper.) Have the students punch holes into their 'animal parts' and attach a piece of string onto it using the holes.
3. The next class period have the students tie on the 'parts' they created last class period to represent the animal they were assigned. (Example: the egret ties its 'beak' onto its face and the 'feet' onto their legs.)
4. Read the following story and have the students act out each part. Remember that this is a melodrama!

Materials

- Baseball cap - human
- Antennae - mosquito
- Fins - mosquito fish
- Dark yellow beak – great blue heron
- Yellow feet and black beak – snowy egret
- Fins and teeth - pike killfish
- Art materials: string, glue, construction paper, colored pencils or crayons, etc.

Down in the Everglades, buzzing through the air, are the most famous inhabitants...the mosquitoes! They fly around searching for their favorite food, animal blood. But these unsuspecting insects land too close to the water where the little mosquito fish can gobble them up! (*Have the mosquito fish pretend to attack the mosquitoes. Have the mosquitoes die a dramatic death.*) The now full mosquito fish swim away through the sawgrass slough licking their lips (although fish don't have lips). But standing in the water, not moving a muscle, is a dangerous carnivore. The great blue heron waits patiently until one of those little mosquito fish swims right in front of it. Then the great blue heron snaps its neck forward and spears the fat little mosquito fish! (*Have the heron pretend to spear the fish with its beak. The fish dies a dramatic death.*) The great blue heron wades through the water licking its beak, now nice and full. The other mosquito fish swim away quickly. But they notice something pretty and yellow on the surface of the water. A snowy egret is flying over the water, dragging its yellow feet to attract the fish. The curious little mosquito fish swim to the surface to investigate and SNAP! Another little mosquito fish is eaten. (*The snowy egret grabs the fish with its beak and the fish dies dramatically.*) The little mosquito fish swim away from the birds, now safe. Or are they? Not too far from these little mosquito fish, a human has released some pike killifish into the water. (*The human pretends to dump something into the waters.*) These fish are very hungry and they immediately spot their favorite food; mosquito fish! The mosquito fish scream as loud as they can underwater (not very loud) and they try to swim away. (*Have them walk quickly, mimicking a run.*) But the pike killifish are bigger, meaner, and faster and they quickly catch up and gobble up each and every mosquito fish. (*Pike killifish pretend to eat the mosquito fish. The mosquito fish die a dramatic death.*)

You may think that is the end of the story, but it isn't. Some time goes by without our little mosquito fish, and the mosquito population has exploded. (*Bring back all the mosquitoes, happy and dancing because they won't be eaten.*) The great blue heron and the snowy egret are trying to find the little mosquito fish to eat, but the fish are gone. The heron and egret eventually die from no more food. (*Have them die a dramatic death.*)

Now all that's left are the pike killifish and the mosquitoes. The Everglades food chain has broken down. But the mosquitoes have plenty of food. They swarm the human!

Evaluation

1. Ask the students what they felt happened during this activity.
2. What would happen if pike killifish spread to other areas of the Everglades?
3. What types of problems can this cause?
4. Can you think of other exotic species that can hurt an ecosystem like this?
5. How?

Everglades “Most Wanted”

Subject: Science, Language Arts

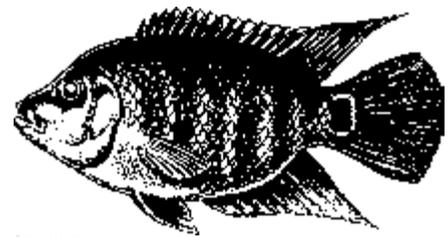
Duration: 2-3 Class Periods

Location: Classroom

Vocabulary: Competition, Exotic Species, Habitat, Native Species

Related Activities: Population Explosion, Break the Chain, Unwanted Guest, Go Back Home, Going...Going...Gone!, Fishy Business

Florida Sunshine State Standards: SC.H.1.2, SC.H.1.3, SC.G.2.3, LA.B.1.2, LA.B. 2.2



Objectives. Students will be able to define exotic and native species and give an example of each. Students will be able to explain how an exotic species can harm native species or habitats.

Method. Students will research the most wanted invasive species in the Everglades and “investigate” these species to determine which natives are most affected.

Background. Most people think that alien species come from outer space. But they are really just plants and animals that have been transported to an area that they aren’t normally found in. This can be detrimental to the native species that are living there.

Materials

- Copy of “Everglades Most Wanted”
- Copy of “The Plaintiffs”
- Copy of “Case Profile”

Suggested Procedure

1. Divide your students into 9 teams as evenly as possible. Tell them that they are now bio-detectives trying to locate “Everglades Most Wanted.”
2. Have students read the background information on exotic species that are found in the Everglades.
3. Hand out the “Everglades Most Wanted” sheet to the students. Tell them that these are the most wanted exotic species. What are these species? Why are they wanted? These are questions that the bio-detectives must answer.
4. Hand out copies of “Case Profile” and “The Plaintiffs” to the groups.
5. Explain to the students that their job is to perform the following detective work. They are to gather information to complete a “case profile” for one of the “most wanted” species. Based on this information, students should be able to figure out which species on the “plaintiff” sheet is being harmed by their “most wanted” species. Assign one “most wanted” species to each group. They can use the provided background information or research it on their own in the library and on the Internet.
6. Have the students share the results of their investigation. Go through the plaintiffs one at a time and ask the students whose “most wanted” species are contributing to its decline.

7. Have the group tell the class what else they had learned about this “most wanted” species. Note to teacher: for the sea turtle plaintiff, there are two exotic species that can help contribute to its decline-- the Australian pine and the wild hog, however the Australian pine influences the sea turtles more.

Evaluation

1. Each of these species has something in common. What is it?
2. What are some other exotic species that are found in the Everglades?
3. What are some other native species that can be affected by exotic species? How?

Extension

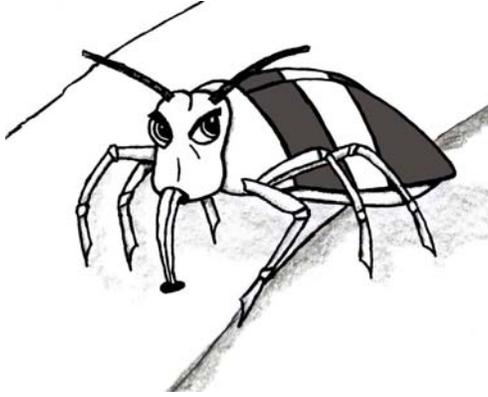
Have each student make a “most wanted” poster for an exotic species that wasn’t mentioned in this activity. This poster should include a picture, the name of the species, and basic information such as the background of the species and what kind of trouble it’s causing.

Everglades "Most Wanted"

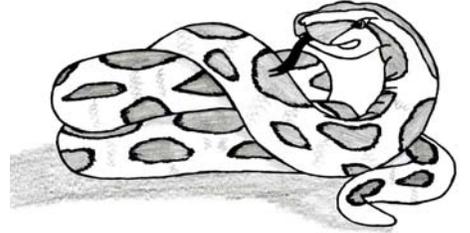
Australian Pine



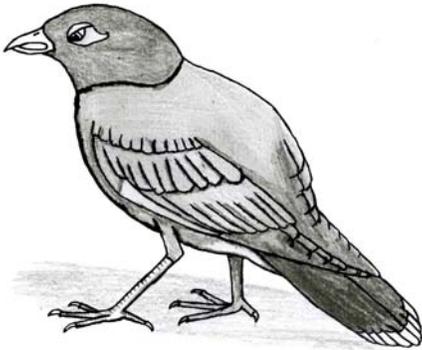
Bromeliad Weevil



Burmese Python



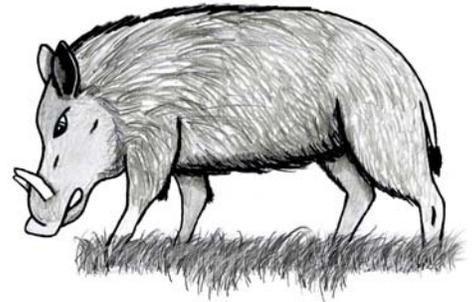
Common Myna



Cuban Treefrog



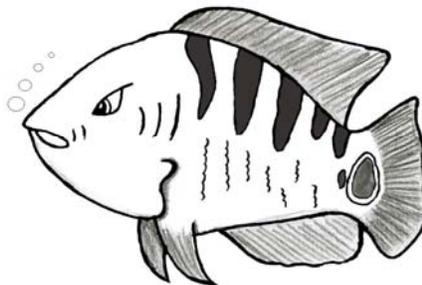
Feral Pig



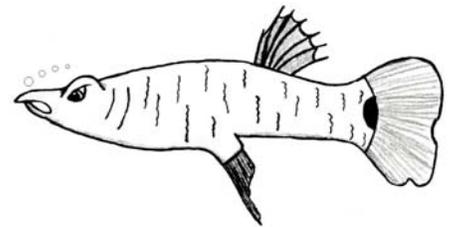
Melaleuca



Mayan Cichlid



Pike Killifish



Case Profile

Species _____

Detectives: _____

Aliases: _____

Origin: _____

Distinguishing Features: _____

Preferred Everglades Habitat: _____

Which plaintiff is suffering problems because of this species? _____

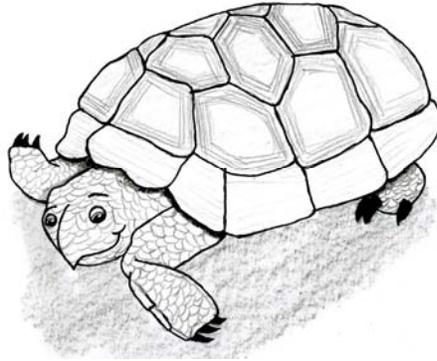
Why?

The Plaintiffs

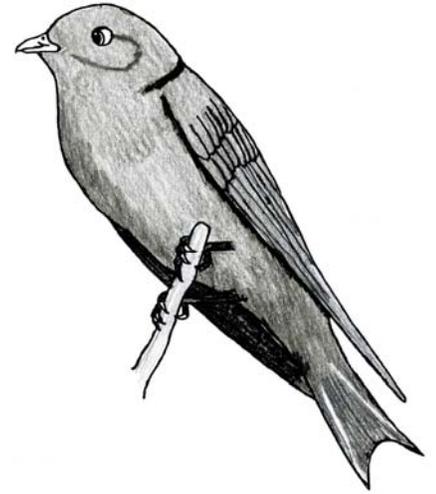
Bromeliad



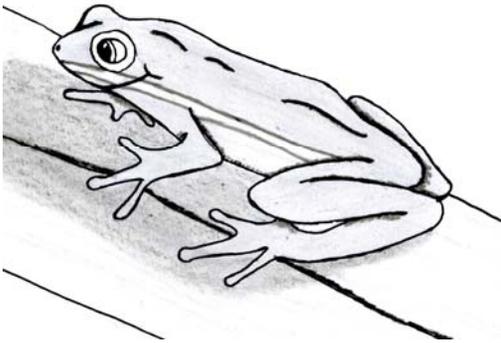
Gopher Tortoise



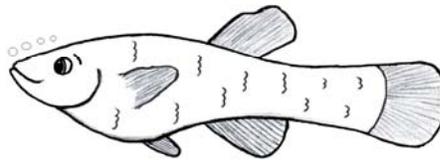
Purple Martin



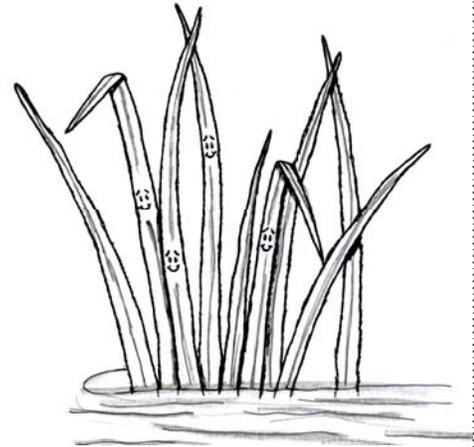
Green Treefrog



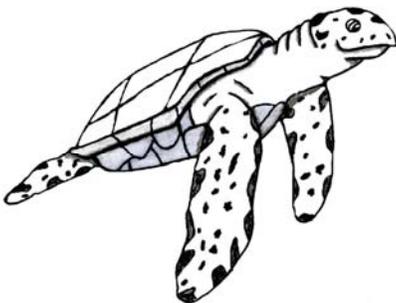
Mosquito Fish



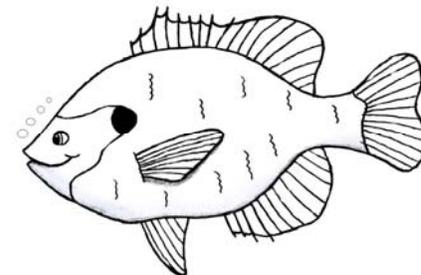
Sawgrass



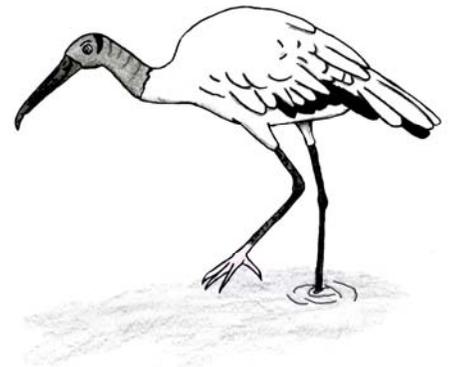
Seaturtle



Sunfish



Woodstork



Population Explosion

Subject: Math, Science, Reading

Duration: 3-4 Class Periods

Location: Classroom / Indoors

Vocabulary: native, exotic, wetland

Related Activities: Fishy Business, Everglades “Most Wanted,” Unwanted Guest, Go Back Home, Going...Going...Gone,! Break the Chain

Florida Sunshine State Standards: SC.H.1.2, SC.H.1.3, SC.G.2.3
LA.B.1.2, LA.B. 2.2,MA.A.4.2



Objectives: Students will be able to 1) Recognize melaleuca and tell how the seeds are dispersed, 2) Describe that melaleuca produces over 1 million seeds per year and have a concept of how much that really is, and 3) Determine the population of melaleuca seeds for their wetland ecosystem through sampling.

Method: Through a simulation, sampling, and estimation activity, students learn about the impact of melaleuca on a wetland due to its exponential growth. They learn about melaleuca’s way of life and appreciate how scientists determine population size in an ecosystem.

- | |
|--|
| <p>Materials</p> <ul style="list-style-type: none">• String• Poster board• Art Supplies• Copies of Dot Worksheet• Copies of Answer Worksheet• Cotton Balls |
|--|

Background: Melaleuca is an aggressive non-indigenous plant that rapidly disperses throughout wetland areas. It is an unwelcome intruder because it interferes with the growth of native species and occupies spaces where natives would normally grow. Melaleuca creates many problems through its competitive advantage that causes an imbalance in the wetland ecosystem.

Florida holds the title of having the second worst invasive exotic plant problem in the United States only after Hawaii. Over 25,000 exotic plants have been introduced to Florida since the New World was discovered. Invasive exotic plants, such as Brazilian pepper, melaleuca, and Old World climbing fern, pose a serious threat to the south Florida ecosystem, native plant communities, along with threatened and endangered species. Generally, exotic plants in south Florida tend to establish in disturbed areas. Melaleuca is one of the introduced plant species that is not restricted to disturbed areas.

Melaleuca is a native of Australia and was introduced in southwest and southeast Florida in 1906 as an ornamental tree and for timber. Soon after, the trees began invading wet prairies and marshes of the Everglades. In the 1930s and 1940s melaleuca was planted along the rim of Lake Okeechobee and in an area that is now part of Big Cypress National Preserve.

Melaleuca is an extremely hardy tree that thrives in wet, flooded habitats. Its thick bark acts as an insulator protecting it from damage. It is both cold and fire resistant. When melaleuca trees reach four or five years of age, they begin flowering. In south Florida, a tree will flower up to 6 times per year. There can be as many as 40 flowers on a stem and 400 seeds per flower. In one

year a melaleuca can produce up to 1 million seeds and can store up to 20 million. The seeds are very small and have “wings” which enable them to travel long distances on wind.

Any disturbance to the tree, including fire, drought, lightning, mechanical disturbance, or cold causes the seed pods to open and release the seeds. Herbicide treatment will also cause the tree to release its millions of seeds. Because of this, it was estimated that melaleuca trees advanced across the Everglades at a rate of 50 acres per day. By the early 1990s, melaleuca trees had invaded 488,000 acres in south Florida.

Strands of melaleuca can become so dense that animals and people are unable to travel through them. Dense areas can impede water flow and cause higher water loss. Many people are allergic to melaleuca pollen and it also takes away wildlife habitat. Melaleuca strands are only occasionally used for nesting and roosting birds. Today, melaleuca has become a threat to the character of the irreplaceable Everglades ecosystem.

Suggested Procedure

1. For one or two class periods, have the students in groups draw a wetland ecosystem that is found in south Florida on the posterboard. (Hint: have each group draw a different type of habitat)
2. Distribute the information sheet on melaleuca and discuss this with the students. Also discuss methods that scientists use to study ecosystems, as the students will be doing an example of this with their posterboard.
3. Have the students work through the activity sheet “How Much Is One Million Seeds?” to realize the enormity of this number. If possible, bring in one ream of paper (500 sheets). One ream of paper with 2000 dots on each page would make 1 million dots!
4. Have students work within the same groups they were in for step 1. Students make a grid on the wetland poster by drawing lines or stretching string to make equal-sized sections. For example, posterboard that is 22x28 inches (56x70 centimeters) could be divided into sections of 14 square centimeters. Students could mark off every 14 centimeters down (4 marks) and every 14 centimeters across (5 marks). The total number of sections would be 20. Then have students draw lines in or stretch strings across at these marks and tape them down. Stretching string across the posterboard would be a simulation of what is actually done in the field. Last, have the students number the posterboard sections.
5. Each group lines up their wetland ecosystem side by side leaving no spaces. The teacher spreads out a bag of cotton balls on cardboard. This will represent the “parent” melaleuca strand. With a fan or hair dryer, the teacher simulates the wind and spreads the seeds to every ecosystem. Students should take their ecosystems back to their desks to count the seeds. They must guess how many “melaleuca seeds” are in one section.
6. Then they should guess how many seeds are dispersed throughout the whole ecosystem. Students should look at their wetland and determine what section will be used to count the melaleuca seeds. All the seeds in this section are to be counted, and each group can devise their own way of doing it. To find the estimate, students should know that the size of the population equals the number in the section that was counted, multiplied by the number of

sections. **Population=Number in One Section x Number of Sections.** If there is time, have students estimate and then count another section. Compare the results.

7. Compile the data from each of the groups. The ecosystem closer to the parent plant (fan) will receive more of the seeds. Notice how the seeds can be spread by the wind. Draw the ecosystems on the chalkboard and duplicate the path of the spreading seeds.

8. Discuss the following questions (with sample answers):

Melaleuca seeds can also travel by water and on things that move from place to place. How would this affect our findings? *The different ways they are transported would affect how far and how fast the seeds could be dispersed.*

Did each section of your ecosystem have the same number of seeds? Which ecosystems had the most seeds? The least seeds? What factors determined which ecosystems got the most? *Each section counted should yield a different number of seeds. Ecosystems closer to the fan should receive the most seeds if the wind is not very strong. Students need to realize that a scientist cannot possibly count every organism. If they could, that organism would only be found in low numbers, meaning that the organism is probably endangered or almost extinct.*

Evaluation

1. Have students describe how to count the number of insects in a square meter area of the playground, using the sampling method.
2. By making calculations, have students compute how many sheets of paper with dots are needed to make 3 million.

Extension

Have students research the difficulty of getting rid of melaleuca and its impact on a wetland. How does it upset the balance of a wetland ecosystem?

How Much is One Million Seeds?

Objective: To realize the magnitude of large numbers and to see how many dots will make one million.

Directions: Please read all questions and show any work necessary to calculate your answers. All questions refer to the number of dots on the worksheet.

1. How many dots are there on the worksheet? _____
2. How many total dots would there be on 5 sheets of paper? _____
3. How many total dots would there be on 50 sheets of paper? _____
4. How many sheets of paper would it take to make 1 million (1,000,000)? _____
5. How many sheets of paper would it take to make 20 million (20,000,000)? _____

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5. How many sheets of paper would it take to make 20 million (20,000,000)? _____

How Much Is One Million Seeds? (Answer Key)

Objective: To realize the magnitude of large numbers and to see how many dots will make 1 million.

Directions: Please read all questions and show any work necessary to calculate your answers. All questions refer to the number of dots on the worksheet.

1. How many dots are there on the worksheet? _____
[40 x 50 = 2,000]

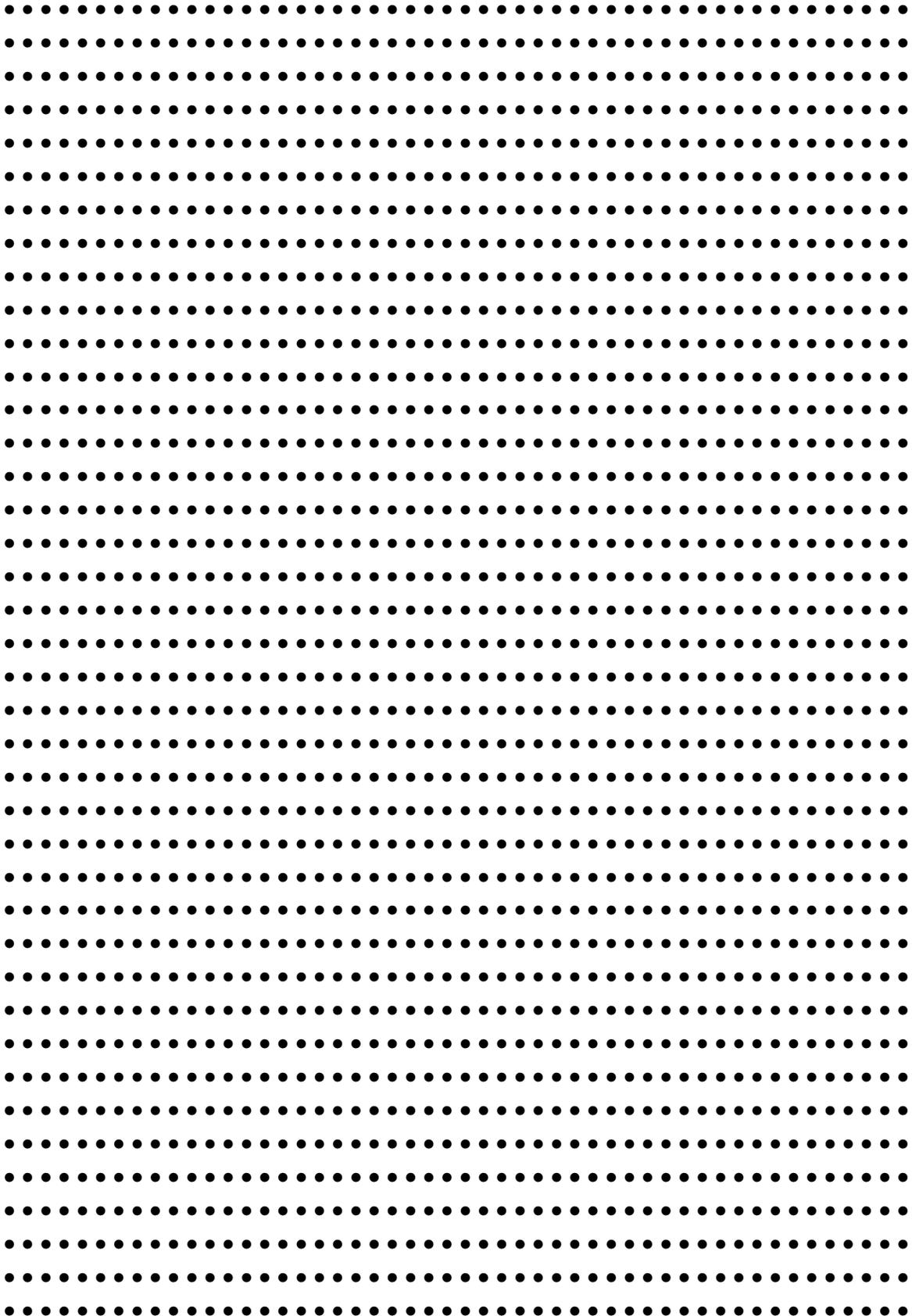
2. How many total dots would there be on 5 sheets of paper? _____
[2,000 x 5 = 10,000]

3. How many total dots would there be on 50 sheets of paper? _____
[2,000 x 50 = 100,000]

4. How many sheets of paper would it take to make 1 million (1,000,000)? _____
[1 million would be 10 x the number above = 10 x 50 = 500]

5. How many sheets of paper would it take to make 20 million (20,000,000)? _____
[20 million would be 20 x the number above = 20 x 500 = 10,000]

Dot Worksheet



Fishy Business



Subject: Math, Science

Duration: 1 Class Period

Location: Classroom

Vocabulary: exotic, native, food chain, predator, prey

Related Activities: Break the Chain, Everglades “Most Wanted,” Unwanted Guest, Go Back Home, Going...Going...Gone!, Population Explosion

Florida Sunshine State Standards: MA.E.3.2, SC.G.1.1, SC.G.2.1

Objectives. Students will be able to 1) Discuss a basic food chain, 2) Define and give examples of exotic species, 3) Discuss how exotic species can disrupt a food chain.

Method. Students will examine the effect of exotic species on an ecosystem by role-playing both a healthy food chain and one that has been impacted by Mayan cichlids.

Background. Exotic species are plants or animals that are not native to a certain habitat. One of these species is called a Mayan cichlid. This fish invades the habitat of the native sunfish and competes for the same food source. Both the cichlid and the sunfish eat small fishes and aquatic invertebrates. The cichlid is also an aggressive eater, usually being the first to reach a food source and fighting off the native sunfish. This becomes a problem for the native sunfish as they are losing food sources and cannot compete with the more aggressive cichlids for food. The cichlids are faster and more aggressive and, therefore, find and consume more of the food.

Materials

- “Food tokens”
- Gym vests or colored t-shirts
- Four hula-hoops
- Pencil and paper
- Whistle

Suggested Procedure

1. Select students to either be egrets or sunfish - approximately one egret for every four to six sunfish. You will not yet choose students to be the cichlids, the first few rounds are to see how a normal food chain would work. Use gym vests or colored t-shirts to help identify predators from prey.
2. Using a gymnasium or field, identify one end of the field as the “food source” and the other end as the “shelter.”
3. Place the four hula-hoops in the open area between the “shelter” and the “food.” These will represent shelter or cover for the sunfish and can be randomly distributed on the field.
4. “Food Tokens” (poker chips or pipe cleaners work as well) are placed at the end of the field designated as “food source.” Be sure to have at least 3 food tokens for each sunfish.
5. Use the whistle to start each round. When a round begins, sunfish start from their shelter. The task of the sunfish is to move from the primary shelter to the food source, collecting one food token each trip, and returning to the primary shelter. Their travel is hazardous, however. They need to be alert to possible predators like the egrets. If they spot an egret, they can hide under cover (in a hula-hoop) for 5 seconds.

6. The egrets start the activity anywhere in the open area between the ends of the field and thus are randomly distributed between the sunfish's food and the primary shelter. Egrets attempt to capture sunfish for food, tagging only the sunfish that are not under cover. When a sunfish is eaten, they must go sit on the sidelines for the duration of the first round. During each round, an egret can only eat (tag) 2 sunfish. This is their food limit. (Reminder: sunfish have a food limit of 3)

7. When each sunfish has accumulated 3 tokens at the primary shelter, a round is over. Using the paper and pencil, have the students record how many sunfish were able to survive.

8. Optional - play another round using just the native sunfish and the egrets and record that data as well. See how many sunfish are able to survive each round.

9. Note: establish ground rules for student behavior. Behave in ways that are not harmful to other students: no tackling, shoving or hitting! Also, have the students *walk*, this way they aren't colliding.

10. After a few rounds of the natural food chain, introduce the Mayan cichlids. Choose about 1/4 of the students to represent the cichlids. The rounds will continue as before, but this time the way the students move will be different. Since the cichlids are faster and more aggressive, they are able to move normally. The sunfish must now hop on one leg to symbolize their slower movement. So they don't get tired, the students can switch legs after they've hopped on the same one 5 times.

11. Record the number of sunfish that survived versus the number of cichlids.

12. Play another round, this time increasing the number of cichlids. Any student who was "eaten" during the previous round is now a cichlid. This continues for as many rounds as long as there are sunfish. Remember to record the number of cichlids versus the number of sunfish at the end of each round.

Evaluation

1. What might be the eventual result if we continued this activity?
2. Is this result favorable? Why or why not?

Extension

Have the students create a bar and line graph illustrating the results of the experiment. Once the students have recognized the negative effects of the Mayan Cichlids, have them put together a brief classroom presentation on how they might propose solving this difficult problem and prevent such a thing from happening again.

CROSSWORD PUZZLE CLUES

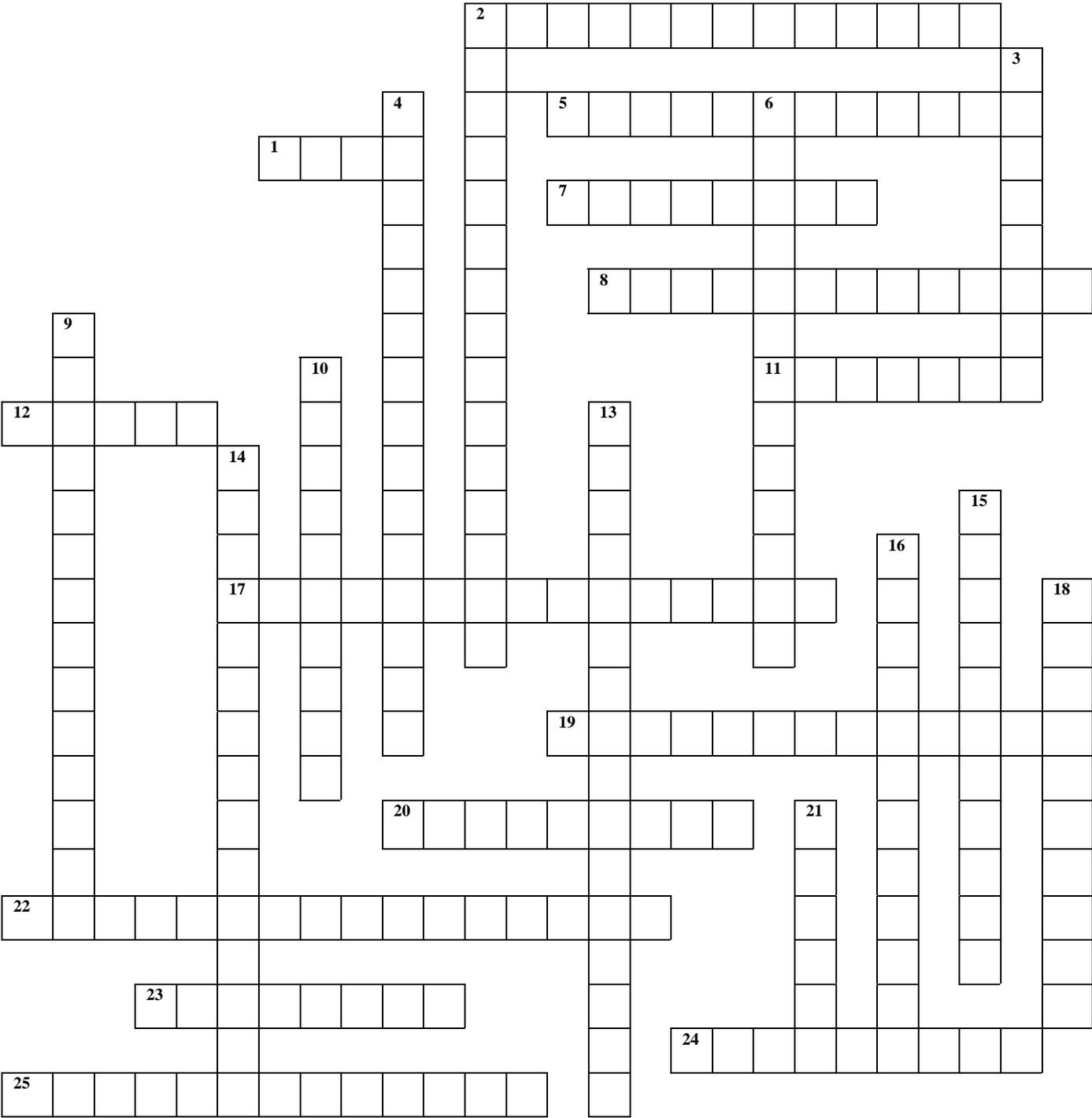
ACROSS

1. _____ birds sometimes attack purple martins.
2. This large reptile preys upon mammals, birds, reptiles, amphibians, and fish.
5. This bird tends to stay in urban areas.
7. This climbing plant can eventually cover an entire forest.
8. These exotic fish are one of the most common fish caught.
11. _____ destroy native plants and feed on endangered sea turtles. (Hint: first word is another name for feral)
12. Competes with native fish for food and spawning areas.
17. Crowds out native vegetation and attacks native plants with toxins.
19. Causes major reductions in native mosquito fish populations.
20. The _____ can be a nuisance to homeowners when it digs up lawns looking for food.
22. These animals make great pets, but when wild they prey on native wildlife and spread diseases.
23. These insects are found across the southeastern United States and they can give a painful sting when bothered.
24. This tree is the true terror of the Everglades and can turn the River of Grass into a dense forest quickly.
25. This amphibian reduces the number of native frogs by eating them and their food source.

DOWN

2. This tiny invader attacks air plants, many of which are endangered or threatened.
3. The European _____ causes damage to agricultural crops by eating seeds, livestock feed, and pulling up seedlings.
4. This fish is able to quickly move from one body of water to another by using a unique travel method.
6. This eel species from Asia has a big appetite and competes with native aquatic species.
9. This tree sterilizes the ground and destroys habitat for wildlife.
10. Responsible for a decrease in native green anole populations.
13. This reptile has invaded more places than the other 6 similar species.
14. This rodent can grow up to 9 pounds and has no predators.
15. Certain areas with a high population of this fish are completely empty of native fish and plants.
16. Found in coastal areas, this plant grows in dense thickets.
18. Grows in a thick tangle that make it hard for wildlife to travel through.
21. This green reptile is a popular pet that often is released or escapes.

Crossword Puzzle



Word Find

S B L U E T I L A P I A Y V L Y G O D I U M H
N P I S R T C U S E A S I D E M A H O E C R N
O A R T P E U R O P E A N S T A R L I N G L D
H S M I W I C U B A N T R E E F R O G N U R R
T I A A A B R A Z I L I A N P E P P E R K C I
Y A Y B R O M E L I A D W E E V I L I W A T M
P N A R M E L A L E U C A L M Y N A B I R D O
E S N B T G A M B I A N P O U C H R A T M T S
S W C W P U R I G U A N A N E N G L L W G N N
E A I H C W A L K I N G C A T F I S H O R A L
M M C O A U S T R A L I A N P I N E H R A E A
R P H R S S G O S S B A A W G A N D A W M R T
U E L R L C E F E R A L D O G I L I G L E I M
B E I F E R A L C A T A B R L I G M N L E F O
E L D H A R I R A A L B D B W W P E G E E T O
I U T A O A C A A O T U L C N I A L I T H P W

Find each of the following words. They can be forwards, backwards, or diagonal:

BURMESE PYTHON	ASIAN SWAMP EEL	GAMBIAN POUCH RAT	AUSTRALIAN PINE
IGUANA	BRAZILIAN PEPPER	BLUE TILAPIA	FIRE ANT
EUROPEAN STARLING	CUBAN TREE FROG	WALKING CATFISH	FERAL DOG
OSCAR	WILD HOG	MAYAN CICHLID	LYGODIUM
MYNA BIRD	BROWN ANOLE	BROMELIAD WEEVIL	
SEASIDE MAHOE	MELALEUCA	FERAL CAT	

Word Find

Answer Key

BLUETILAPIA LYGODIUM
N SEASIDEMAHOE
OAEUROPEANSTARLING
HSM CUBANTREEFROG
TIA BRAZILIANPEPPER
YAYBROMELIADWEEVIL
PNA MELALEUCALMYNABIRD
ESN GAMBIANPOUCHRAT T
SWC IGUANAN GN
EAI WALKINGCATFISHO A
MMC OAUSTRALIANPINEH E
RPH S W D R
UEL C FERALDOG L I
BEIFERALCAT R I F
LD R BW

Riddles

Can You Figure Them Out?

1. A Brazilian beauty I was brought in as a decorative plant.
Raccoons and birds spread my seeds, not the tiny-tiny Ant.
Eventually the native trees die because they are unable to survive.
A chemical from my leaves stops their growth, allowing me to thrive.
-

2. Hey mate! I am from down under,
The water from the Everglades is what I plunder.
I am known as the true terror of the 'glades,
An aggressive invader; many wish we were old maids.
-

3. I am known to flower all year long,
Wind dispersed seeds make my survival chances strong.
My roots grow through the sand where you play
Making it hard for sea turtles to lay.
-

4. I grow quickly and produce a mass of tangled vines,
Naturally blocking out the sun, and I don't produce wine.
I am very dangerous for hardwood trees
Changing nutrient cycles quick as you please.
-

5. I love the salt and tolerate the drought,
My fruit floats and scatters about.
From shoreline to shoreline I have dense strands
The native plants wish I had stayed in my native lands.
-

6. I lay a mat that can be 4 feet deep,
Blocking the way for animals that creep
I cover entire forests of cypress trees,
Allowing fires to burn higher than their knees.

7. I am not a bird of the cloth, but I am a monk
Some people think I'm a little fat feathered hunk.
My impact on native birds, is I compete for their food,
Around fruit trees they say my actions are quite rude.

8. I love to mimic the way other birds sing and talk.
I transfer malaria, causing other birds to squawk.
If you build a nest it will soon become my home.
As an omnivore for food I have freedom to roam.

9. We transfer the mites that love to bite,
With the native birds we love to fight.
With our large flocks we cause much harm
To trees, houses and Old McDonald's farm.

10. From Southeast Asia I'm a popular pet.
I really do like it here in Florida where it is humid and wet.
Eating endangered species are a part of what I will prey,
Prompting park officials to not invite me to stay.

11. Central and South America is where I got my start,
Florida is now where I can run and dart.
My diet consists of crops, as well as rare and endangered plants,
Just like sunbathers you will never see me wearing pants.

12. This lizard is found all around houses,
He migrated from Cuba by the dozens.
They are known for decreasing the native habitat
Where their green cousin is found at.

13. My impact in Florida is really quite a mystery.
They think I travel around via the palm tree.
From Southeast Asia I ventured here,
Creating a lot of worry and fear.

14. From out of Africa across the big blue,
I out compete other fish, perhaps one you knew.
Tolerant of the cold, spreading through the state;
No known enemies, taking away places others choose to mate.

15. Look and you will find me in a shallow slough
Eating native mosquito fish that don't have a clue.
We can tolerate waters that are low in oxygen,
And eat those that control the mosquito population.

16. I'm not as popular as the award from Hollywood.
I came from South America and spread as far as I could.
I love canals and water conservation land
And I am loved by every fisherman.

17. We have long mustache whiskers, and a sharp dorsal fin,
I walk on land if I don't like the water I'm in.
They say we kill largemouth bass just for fun
Dominating pools of water that shrink under the heat rays of the Florida sun.

18. Known to alter community structure,
They may have lived during the Mayan culture.
Aggressive and mean it takes over the places
Where native fishes like to make kissy faces.

19. Looking like a long hot dog with a tail,
This thing will scare you without fail.
In the Asian markets it's considered quite a dish,
Its voracious appetite brings a decline in native fish.

20. This evil insect came from Mexico.
To native bromeliads it's a dangerous foe.
It's young drill holes in bromeliad leaves,
Becoming one of the air plant's pet peeves.

21. Disturb their mounds and you are sure to get a venomous bite.
Invertebrates and small birds satisfy their appetite.
Very adaptable they can survive droughts and flood,
This insect is the color of blood.

22. This species of frog comes from the West Indies,
Feeding on native green tree frog species.
Reducing native frogs through hungry eating,
Skin secretions stop birds from feasting.

23. Walking on the ground with its armored shell,
This little mammal burrows holes in which to dwell.
Carrying dangerous diseases like encephalitis and leprosy,
Young amphibians and reptiles are what their palate fancies.

24. From Africa I travelled to Grassy Key
And without predators I can run free.
A 9-pound danger to native woodrats
Nothing can stop me, not even cats.

25. I have a long snout and my tail is hairy
The diseases I spread are kinda scary
I uproot plants and leave deer-like tracks
In Arkansas I'm known as a razorback

26. We got our start being dumped in the wild.
Native animals have us eating in style.
We love to feast on native birds and reptiles,
Doing our best hunting when the sun rests for a while.

Riddles

Answer Key

1. Brazilian Pepper
2. Melaleuca
3. Australian Pine
4. Latherleaf
5. Seaside Mahoe
6. Lygodium
7. Monk Parakeet
8. Myna Birds
9. European Starling
10. Burmese Python
11. Green Iguana
12. Cuban Anole
13. Indo-Pacific Gecko
14. Blue Tilapia
15. Pike Killifish
16. Oscar
17. Walking Catfish
18. Mayan Cichlid
19. Asian Swamp Eel
20. Bromeliad Weevil
21. Fire Ants
22. Cuban Tree Frog
23. Nine-Banded Armadillo
24. Gambian Pouch Rat
25. Feral Pig
26. Feral Cats and Dogs

What Doesn't Belong?

Answer Key

On the following pages are blackline masters of four different habitats found in the Everglades. Copy these drawings for the students, either individually or in groups, and have them figure out what doesn't belong in that habitat. Each picture contains both native and exotic species.

Below are the species that can be found in each picture:

Cypress Slough

Natives:	Bald Cypress	Exotics:	Bromeliad Weevil
	Bromeliads		Lygodium
	Orchids		Brown Anole
	Ferns		Pike Killifish
	Mosquito Fish		Asian Swamp Eel
	Apple Snails		
	Crayfish		
	Glass Shrimp		
	White Ibis		
	Otter		

Sawgrass Marsh

Natives:	Sawgrass	Exotics:	Melaleuca
	Periphyton		Burmese Python
	Alligator		Walking Catfish
	Great Blue Heron		
	Apple Snail		
	Snail Kite (flying)		

Coastal Dune

Natives:	Sea Oats	Exotics:	Seaside Mahoe
	Panic Grass		Australian Pine
	Beach Cordgrass		Iguana
	Prickly Pear Cactus		
	Sea Ox-Eye Daisy		
	Sea Turtles		
	Plover		
	Terns		
	Beach Mouse		

Tropical Hardwood Hammock

Natives:	Red maple	Exotics:	Brazilian Pepper
	Live Oak		Cuban Tree Frog
	Sabal Palm		Gambian Pouch Rat
	Gumbo Limbo		
	Royal Palm		
	Lysiloma		
	Florida Tree Snail		
	Schaus Swallowtail		
	Deer		
	Green Anole		
	Panther		

What Doesn't Belong?

Can you figure out what species do not belong in these habitats?

Cypress Slough

Exotic Species I have Found: _____

Now challenge yourself and see if you can name some of the **Native Species**: _____

Sawgrass Marsh

Exotic Species I have Found: _____

Now challenge yourself and see if you can name some of the **Native Species**: _____

Coastal Dunes

Exotic Species I have Found: _____

Now challenge yourself and see if you can name some of the **Native Species**: _____

Tropical Hardwood Hammock

Exotic Species I have Found: _____

Now challenge yourself and see if you can name some of the **Native Species**: _____



CYPRESS SLOUGH



SAWGRASS MARSH



COASTAL DUNE



TROPICAL HARDWOOD HAMMOCK

Vocabulary

ALIEN – A plant or animal that does not belong in the area it is found.

BIOLOGICAL CONTROL – reduction in numbers or elimination of pest organisms by introducing parasites or diseases.

CANAL – An artificial waterway or artificially improved river used for travel, shipping, drainage or irrigation.

CHEMICAL CONTROL – The use of pesticides and herbicides to control pests and undesirable plant species.

COMPETITION – Active demand by two or more organisms or kinds of organisms for some environmental resource (such as food, water, shelter or space) in short supply.

DISTURBED AREA – An area where vegetation, soil and/or hydrology have been significantly altered, thereby making a wetland determination difficult.

ECOSYSTEM – The interaction of the biological community (all living things) and the physical environment (Water, Air, Minerals).

ENDANGERED SPECIES – A species of plant or animal that throughout a significant portion of its range is in danger of extinction. There are fourteen endangered species in Everglades National Park.

ENDEMIC – Species found only in a particular region or habitat.

ERADICATION – The complete destruction of every species within a population.

EXOTIC – Not native; or something that did not grow in this area before humans brought it from another location.

EXTINCT – A species that has vanished from existence.

HABITAT – The place where a plant or animal lives; an organism's home. It takes up as much as an organism needs to find its food, water, shelter, and space in the proper arrangement.

HERBICIDE – A chemical that destroys plants or stops their growth.

INDIGENOUS – A species that is found in the place where it originated.

INTRODUCED – Bring something new to an environment.

INVASIVE – Spreading aggressively into an area.

MECHANICAL CONTROL – Control of pests by physical means such as the use of screens or row covers.

NATIVE – A species that belongs in the area that it is found; species that grew naturally in an area before humans.

NATURAL ENEMY – Living organisms found in nature that kill, weaken, or reduce the reproductive potential of other organisms.

NON-NATIVE – Species that has been introduced to an area by humans; does not occur naturally in the area that it is found.

PHYSICAL CONTROL – Control of pests by physical means such as heat, cold, sound waves, etc.

PRESCRIBED BURN – Is a fire management technique of purposeful burning to reduce buildup of flammable products.

RIVER – A large natural stream of water (larger than a creek).

SEED DISPERSAL – The method that a plant uses to spread its seeds for growth, either by wind, water currents, birds and mammals, or by simply dropping the seeds.

STRATEGIES – An elaborate and systematic plan of action.

SUCCESSION – The gradual change in an ecosystem brought about by replacement of one community by another until a stable climax is established.

SURVEY – A detailed critical inspection; the act of looking, seeing or observing.

THREATENED – Likely in the near future to become endangered.

TREATMENT – The techniques or actions applied in a specified situation.

Web Resources

Invasive Species (general)

The Nature Conservancy's site has easy-to-find information on invasive issues
<http://nature.org/initiatives/invasivespecies/>

Fish

List of exotic freshwater fishes in Florida
<http://myfwc.com/fishing/fishes/non-native.html#armored>

Plants

Florida Department of Environmental Protection
<http://www.dep.state.fl.us/lands/invaspec/index.htm>

Atlas Project, University of South Florida
<http://www.plantatlas.usf.edu>

Florida Native Plant Society
<http://www.fnps.org>

University of Florida's Center for Aquatic and Invasive Plants
<http://aquat1.ifas.ufl.edu/>

Florida Gardner Shade Tree Recommendations
<http://www.floridagardener.com/misc/shade.htm>

Exotic Plant Management

Collier County Environmental services department
<http://www.co.collier.fl.us/natresources/exotics/>

Institute for Regional Conservation
<http://www.regionalconservation.org>

Water Conservation

South Florida Water Management District
<http://www.sfwmd.gov/site/index.php?id=34>

U.S. Army Corps of Engineers Aquatic Plant Control
http://www.saj.usace.army.mil/conops/apc/apc_page.html

Help to Fight the Spread of Exotics!

From <http://nature.org/initiatives/invasivespecies/help/>

You can help stop the introduction and spread of exotic species. Help protect native plants and animals by following these six easy guidelines:

1. Verify that the plants you are buying for your yard or garden are not invasive. Replace invasive plants in your garden with non-invasive alternatives. Ask your local nursery staff for help in identifying invasive plants!
2. When boating, clean your boat thoroughly before transporting it to a different body of water.
3. Clean your boots before you hike in a new area to get rid of hitchhiking weed seeds and pathogens.
4. Don't "pack a pest" when traveling. Fruits and vegetables, plants, insects and animals can carry pests or become invasive themselves.
5. Don't release aquarium fish and plants, live bait or other exotic animals into the wild.
6. Volunteer at your local park, refuge or other wildlife area to help remove invasive species. Help educate others about the threat.

If you have a pet that you can no longer take care of...

- Give the animal to someone else.
- Return it to where it was bought, for resale or trade.
- Donate it to a museum, science center, zoo, public aquarium, school, nursing home, hospital, or prison.
- Contact an animal rescue group.
- If the above options are not available have the animal humanly euthanized.
- But whatever you do, **Don't Let It Loose!**

If you do see someone releasing exotics into the wild, here's what you can do!

1. Contact law enforcement with the Florida Fish and Wildlife Conservation Commission. You can do it online at <http://myfwc.com/whatsnew/04/wildlifealertonline-st.html>
2. Or call or write their office
 - a. Miami Area:

3200 NE 151 Street
Miami, FL 33181
305-956-2500

- b. Naples/ Ft. Myers Area:
2423 Edwards Drive
Fort Myers, FL 33901
941-332-6971

Make sure you include a complete description; what the person looked like, the vehicle they were driving with the license plate number, and exactly what you saw the person doing.

If you see a Burmese python within Everglades National Park, this is what you can do to report it!

Call the park's PYTHON HOTLINE as soon as possible to report your observation: (305) 242-7827 or (305) 815-2080.

Or report the sighting to the nearest Park Ranger

Or you can send the information to:

Skip Snow, Wildlife Biologist	or	Lori Oberhofer, Wildlife Technician
Everglades National Park		(305) 242-7889
40001 State Road 9336		Lori_Oberhofer@nps.gov
Homestead, Florida 33034		
(305) 242-7800		

- **What did you see?** (Description of what was observed. What was the color of the snake, what did the pattern look like, etc.)
- **When did you see it?** (Record year, month, day, and time of the observation. Time of day is important.)
- **Where did you see it?** (Be as specific as possible.)
- **How big was it?** (Estimated length and girth.)
- **What was it doing?** (Make note of snake's behavior.)
- **How did it look?** (Any comment on the snake's general appearance or condition.)
- **Did you take any pictures?** (If yes, can the park get copies?)

You can help South Florida and Everglades National Park control the spread of exotic species!

Student Pre-test / Post-test

Before students participate in the program, they should be administered the Pre-test / Post-test. Repeat the test again once students have completed the activities.

1. How many exotic plant species can be found in Everglades National Park?

(circle one)

270 50 140 300 350

2. Define:

a. Exotic Species: _____

b. Native Species: _____

3. List four exotic species found in the Everglades.

- a. _____
- b. _____
- c. _____
- d. _____

4. In what habitat would you find myna birds? (circle one)

- a. Slough
- b. Florida Bay
- c. Urban Area
- d. Your bedroom

5. Which plant is the “terror of the Everglades?” (circle one)

- a. Latherleaf
- b. Melaleuca
- c. Poisonwood
- d. Sawgrass

6. Which of the following exotics have caused 2 species of bromeliads to become endangered? (circle one)

- a. Wild Hogs
- b. Feral Cats and Dogs
- c. Blue Tilapia
- d. Weevil

7. What is responsible for the introduction of exotic species into the Everglades? (circle one)

- a. Humans
- b. Hurricanes
- c. Alligators
- d. Being dropped by passing planes

8. This fish has destroyed native mosquito fish populations in canals. (circle one)

- a. Snook
- b. Sunfish
- c. Pike Killifish
- d. Oscar

9. This exotic mammal sometimes feeds on endangered sea turtles. (circle one)

- a. Panther
- b. Wild Hog
- c. Armadillo
- d. Bear

Answer Key for Student Pre-test/Post-test

1. 140 exotic plant species.
2. Exotic Species - Not native; or something that did not grow in this area before humans brought it from another location.

Native Species - A species that belongs in the area that it is found; species that grew naturally in an area before humans.

3. Variety of answers. Check the Exotic Species List found on page 1 for confirmation.
4. C. Urban
5. B. Melaleuca
6. D. Weevil
7. A. Humans
8. C. Pike Killifish
9. B. Wild Hog
10. B. Python Pete
11. Any number of answers, but it should look like this:

Mosquito larva hatch from eggs in the water. They are then eaten by Mosquito Fish, which are then eaten by Bream/Bass, which are then eaten by Heron/Egrets/Alligators. Those die and are then eaten by Vultures/Decomposers.

Don't Let It Loose Pledge



I pledge to make a commitment to my community to
preserve and protect native species.

I will share with others the impacts of releasing exotic
species and how those impacts affect the native flora
and fauna.

Sign Your Name Here

Bibliography

Photographs Courtesy Of:

Brazilian Pepper

http://www.whwhat.org/Brazilian_pepper.htm

Melaleuca

http://sheridangardens.com/Tress/thetrees_25to30ft.htm

Australian Pine

<http://cghs.dade.k12.fl.us/shs/EcoSearch/infonative.html>

Latherleaf

<http://aquat1.ifas.ufl.edu/colasi.html>

Seaside Mahoe

http://www.keysplants.com/album_s/album_s-Pages/Image24.html

Lygodium

<http://aquat1.ifas.ufl.edu/lygod.html>

Monk Parakeet

<http://www.friendsofsherwoodisland.org/Pages/Birds/AJH-landbirds.htm>

Myna Birds

http://www.beals.us/hawaii/html/3715-common_myna.html

European Starling

<http://www.tamstuart.com/Slide%20Show%202003/pages/European%20Starling%205903.htm>

Burmese Python

<http://www.snakerobots.com/pythonpics.htm>

Green Iguana

<http://www.amazilia.net/images/Herps/Lizard/GreenIguana.htm>

Brown Anole

<http://www.wildherps.com/species/A.sagrei.html>

Indo-Pacific Gecko

<http://wld.fwc.state.fl.us/critters/exotics/SpeciesNumberResults.asp?SPPNO=9>

Blue Tilapia

<http://www.floridafisheries.com/Fishes/restricted.html>

Pike Killifish

<http://www.flmnh.ufl.edu/fish/Gallery/Descript/PikeKillifish/PikeKillifish.html>

Oscar

<http://www.aquahobby.com/gallery/goscaro.html>

Walking Catfish

<http://www.flmnh.ufl.edu/natsci/ichthyology/SouthFlorida/everglades/Marshes/Exotic.html>

Mayan Cichlid

<http://www.flmnh.ufl.edu/natsci/ichthyology/SouthFlorida/everglades/Marshes/Exotic.html>

Asian Swamp Eel

<http://www.flmnh.ufl.edu/natsci/ichthyology/SouthFlorida/everglades/Marshes/Exotic.html>

Bromeliad Weevil

<http://creatures.ifas.ufl.edu/orn/Mmosieri02.htm>

Fire Ant

<http://www.floridaenvironment.com/programs/fe00207.htm>

Cuban Treefrog

<http://wld.fwc.state.fl.us/critters/exotics/SpeciesNumberResults.asp?SPPNO=42>

Nine-Banded Armadillo

http://encarta.msn.com/media_461534280_761558839_-1_1/Nine-Banded_Armadillo.html

Gambian Pouch Rat

<http://www.membrana.ru/lenta/?2440>

Wild Hog

<http://www.neystadt.org/john/album/index-IE.html>

Feral Cats and Dogs

<http://www.feralcare.org/whatIsFeralCats.htm>

Information Gathered From:

<http://wld.fwc.state.fl.us/critters/exotics/exotics.asp>

<http://invasions.bio.utk.edu/invaders/monk.html#Impacts>

<http://www.nps.gov/ever/ed/resources/edexotic.htm>

<http://aquat1.ifas.ufl.edu>

<http://floridafisheries.com/fishes/non-native.html>

<http://creatures.ifas.ufl.edu/index.htm>

http://en.wikipedia.org/wiki/Gambian_pouch_rat

http://www.usatoday.com/news/nation/2005-01-03-fla-rats_x.htm

Activities Adapted From:

Population Explosion – adapted from the Illinois-Indiana Sea Grant activities found in their Exotic Species Compendium of Activities to Protect the Ecosystem (ESCAPE) activity guide. www.iisgsp.org

Everglades “Most Wanted” – adapted from OCEANS OF LIFE: An Educator’s Guide to Marine Biodiversity. World Wildlife Fund (WWF) Windows on the Wild (WOW) series.

All other activities are adapted from activities that were created by the staff at Everglades National Park Environmental Education Centers.