

# Tampa's Lowry Park Zoo

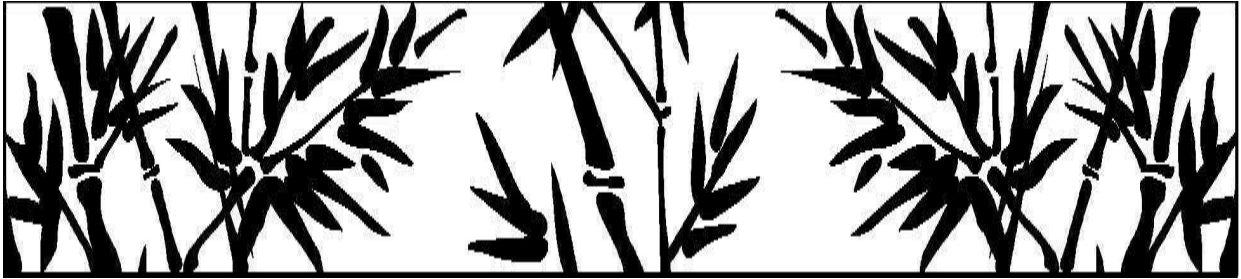
## Educator's Activity Guide

Grades 9-12

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Dear Educator,

We hope you are excited about your upcoming field trip to Lowry Park Zoo. The zoo is an exciting place for children to learn while providing awareness of the natural world around us.

This guide is set up to provide pre-zoo, zoo, and post-zoo visit activities. The activities naturally flow from classroom activities to those that will be done at the zoo. Post-zoo activities will enable you to assess your students' understanding of the lessons they have completed. It is not intended that you incorporate all of these lessons into your curriculum. Feel free to choose what works for you, your students and your curriculum. The activities in this guide focus on endangered species, adaptations, habitats / biomes. Students will be able to take this knowledge with them and apply it to their zoo visit.

Sunshine State Standards and FCAT skills have been integrated into the lessons provided. A chart at the end of this guide provides you with an overview of the standards addressed in each lesson. We hope you enjoy using this guide. It provides many language arts, science, and math lessons to make your zoo learning FUN!

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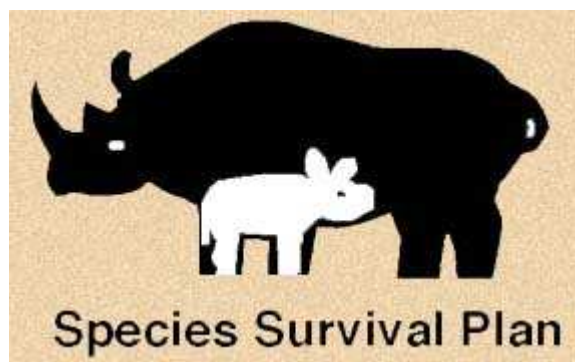
## The Importance of Zoos

Recreation was the focus of the early zoos where crowds came to gawk at the collections of unusual animals and be entertained with animal acts and tricks. As scientists began to learn more about wild animal behavior and ecology, captive management in zoos became more successful. Zoos have evolved into ideal family recreational facilities that most people can afford. However, recreation should be considered passive and zoos should not be developed or promoted as recreation centers.

Education, in its best form, can be very entertaining! The educational function is the main justification for creating a zoo, whether it involved providing general knowledge about animal life or educating the public on the need to conserve wildlife and habitats. If visitors do not leave the zoo better informed about wildlife, the zoo has failed its primary mission. Consequently, most zoos now have education departments and handle large number of people, especially school children, to utilize their zoo day learning experience.

Research complements the prime function of zoos—education. Many institutions lend themselves to studies conducted by university students, academics in related fields, and zoo staff. The more research that can be done on captive wildlife, the better understanding we'll have of the factors that are necessary for the survival of their counterparts.

Conservation is a relatively newer objective of zoos. Zoos have now become more involved in the conservation of animals as the destruction of natural habitats and the subsequent loss of species accelerates. Conservation can be accomplished in two ways: a) maintain captive breeding herds for eventual reintroductions into the wild, and b) create a public awareness for the need to conserve wildlife and their habitats.



Zoos encourage visitors to develop an appreciation for living things and imbue a need to preserve them. If it were not for zoos, many people would not know what a real chimpanzee or tiger even looks like, since no pictures, however vivid, can substitute for seeing actual animals.



## Zoo Careers

**Purpose:** To introduce students to possible career experiences related to Tampa's Lowry Park Zoo. Students will construct summaries of Zoo Jobs by research, interviews and shadowing.

**Objective:** To make students aware of the various job opportunities available at the Zoo.

### Materials:

1. Contact the EdZoocator Instructor at Tampa's Lowry Park Zoo prior to visit and find out which staff members will be available for interviews. (935-8552, ext. 279)
2. "Florida Department of Environmental Protection: "Botany as a Career"
3. Pencil or Pen and a clipboard when you go to the Zoo.

### References:

"The Tampa's Lowry Park Zoo's Guide to Zoological Park Careers"

### Pre-Visit:

1.
  - Have students pick one of the careers listed below.
  - Animal Registrar
  - Assistant Curator of Primates
  - Marketing Assistant
  - Outreach Instructor / Keeper
  - Veterinarian
2. The student should research one of the careers in # 1..
3. Using "Botany as a Career" as a guide, the student should create 10 to 15 generic questions about their career to ask a zoo employee during the visit.

### Visit:

1. The student should interview a Zoo employee and record the answers to the questions.

**Post -- Visit:** The student should create a career fact sheet based upon information gathered from research and interviews. This fact sheet may be submitted to the zoo for possible inclusion in middle and elementary school publications.

**Fast Fact:** Zoos were reported to be in existence in China around 1100 B.C.

## Botany as a Career



What is Botany? Botany is the science study of plants. It includes studying their habitats, distribution, from, chemistry, heredity, and interactions with other living things and the environment. Research in this field of biology helps improve our medicines, foods, fibers, building materials and environmental conditions.

What do botanists do?

Many occupational specialties are related to the biology of plants, here are some examples:

Agronomy is the study of crop and soil sciences to improve the yields of food and fibers.

Biochemistry or phytochemistry is the study of the chemical aspect of plant life process, including possibility useful chemicals produced by plants.

Biotechnology is the study of the application of the principles of physical to plant life processes. Cytology is the study of plant cells, structure, function, and development.

Ecology is the relationship between plants and the world in which they live, System ecology uses mathematical models to demonstrate concepts like nutrition cycling.

Food science and technology is the study of plants leading to the development of new or improved food products from plants.

Forestry is the study of trees as a crop, their cultivation and long-term management.

Genetics is the study of plant genes, plant heredity, and genetic variation and function.

Horticulture is the study of the application of plant sciences towards the production of ornamental plants and, fruits and vegetables.

Plant Pathology is the study of diseases of plants, including disease management and control.

Physiology is the study of plant functions and vital processes of plants, such as photosynthesis and mineral nutrition.

Systematics is the study of plant evolution, how plants have developed into different species and how different types of plants are related to each other. It has the following subdisciplines:

-Taxonomy – the study of plant habits and forms to identify and classify plant groups.

-Chemotaxonomy – the study of chemicals produced by plants as an aid to classifying them.

-Field Botany is the identification and study of plants in their natural habitats, including ecological studies, and the sub discipline exploration – the search for new and undiscovered species.

-Morphology is the study of general plant forms to determine the evolution and development of leaves, roots and stems.

-Paleobotany is the study of plant fossil records to reveal early plant evolution and classify plant groups.

Some botanists combine the specialist of ecology and systematics to study particular types of plants for example-

- Bryology is the study of mosses and similar plants.
- Lichenology is the study of the biology of lichens, organisms, made up of a fungus and an alga.
- Mycology is the study of fungi which are important producers of biological products such as vitamins and antibiotics.
- Phycology is the study of algae, including the sub discipline of studying marine algae (marine botany).
- Pteridology is the study of ferns and similar plants.

Where do they work?  
 Educational institutions employ botanists in research positions or in administrative posts. Federal and state agencies such as the U.S. Department of Agriculture, the Animal and Health Inspection Service, the National Arboretum or the U.S. Forest Service, and the Florida Departments of Environmental Protection and Agriculture and Consumer Services and other employ botanists in many different areas. Trained botanists also work in the pharmaceutical companies, the petrochemical industry, the lumber and paper industries,

seed and nursery companies, biological supply houses and biotechnology firms.

#### Employment and Salary Outlook:

In the 1990's beginning botanists with a bachelor's degree earned between \$19,700 and \$21,200 a year. Those with a masters or doctorate may begin at \$25,000 to \$30,000 depending on the specialty. The average salary of those employed with the state and the federal government varied depending on the level of education and experience, the responsibilities of the position, and the geographical location. Job availability is generally good. Employment opportunities vary over time, depending partly on the status of state and national economies. Challenging positions will be available for well-trained plant scientists.



#### Education:

A bachelor's degree is the minimum requirement for positions such as laboratory technicians, technical assistants in education, industry, government, museums, parks and botanical gardens. Other positions require a masters or doctorate. A Ph.D is required for most teaching and research positions in colleges and universities.

#### Sources:

The Botanical Society of America, "Careers in Botany," Department of Botany, Ohio State University, 1735 Nell Ave., Columbus, Ohio 43210. Hopke, Williams E., *The Encyclopedia of Careers and Vocational Guidance*. Ninth Edition, Volume 1.

For additional information, contact the Florida Department of Environmental Protection, Environmental Education Mall Station 30, Tallahassee, Florida 32399-3000 (904)488-9334.

## II Food Web

**Purpose:** To use the Tampa's Lowry Park Zoo to sight examples of food webs and the process of biological magnification.

**Objective:** To identify producers, primary, secondary & tertiary consumers, and decomposers in a food web.

**Benchmarks:** SC.G.1.4.1.a, SC.G.1.4.1.b, SC.1.4.2, SC.G.1.4.3, SC.G

### Materials:

- 1 Environmental Education Leaflet #6, "Mercury In Florida's Environment", pages 5 & 6.
2. Worksheet "Florida Wildlife Center – Biological Magnification", pages 7 & 8.
- 2 Optional - Disposable or digital camera for each team.
- 3 Pencil or Pen and a clipboard when you go to the Zoo.

### Pre-Visit:

- 1 Review food chain, web, and pyramid terms: producers, primary consumers, secondary consumers, tertiary consumers and decomposers.
- 2 Students should read the article "Mercury In Florida's Environment".

### Visit:

- 1 Complete the worksheet "Florida Wildlife Center – Biological Magnification" while viewing the Florida Wildlife Center.
- 2 Optional - Take pictures, make sketches, or photocopies of these animals.

### Post -- Visit:

Optional - Create a food web using pictures taken at the Lowry Park Zoo. Be creative – posters, Power Point presentations or concept maps are just some of the possibilities.

**Fast Fact:** DDT, banned in the US in the 1970's, is still manufactured in the US and sold to foreign countries where it is used as an agricultural pesticide.

# MERCURY IN FLORIDA'S ENVIRONMENT

## Background

In 1989 a three-agency monitoring project Found high levels of mercury in fish from the Everglades. Mercury is a human neurotoxin, and its consumption in contaminated food has caused illness and death around the world.

Finding high mercury levels in fish led the State Health Officer to issue a series of Health Advisories urging anglers not to eat some species of fish caught in the Everglades, and to sharply limit consumption of largemouth bass taken from other fresh waters in Florida.

Five years later, we know that about one million acres of the Everglades drainage system contain fish with very high levels of mercury: largemouth bass that average over 2 parts million mercury (which exceeds all health based standards). More than another million acres of Florida waters contain largemouth bass with elevated, but lesser, levels of mercury. When sampling is completed we expect that mercury problems in bass will be found in one half to two thirds of Florida's lakes and streams.

High levels of mercury in fish is not limited to Florida. Thirty-four states have issued health advisories restricting consumption of fish, and similar problems are found widely spread throughout North America, Europe and Asia. Most lakes in southern Canada and Scandinavia, for example, show mercury contamination. It is generally accepted that this widespread mercury problem is caused by atmospheric pollution.

Major sources to the atmosphere are mining and smelting of metals, coal-fired utilities and industry, and the use and disposal of mercury in commercial products. Both long distance transport and localized deposition around some types of sources may be important.

The usually severe problem in the Everglades may be from several factors. The principal concerns in the Everglades focus on local effects of municipal incinerators and other emissions sources on Florida's southeast coast, increased release of mercury from the soils of the Everglades Agricultural Area promoted by drainage and soil disturbance, or because of hydrologic changes from the Flood Control Project.

## Environmental Controls

Our lack of knowledge of the causes limits our ability to correct the problem of too much mercury in fish, but one generalized solution is clear: *we must limit mercury emissions to the environment*. Florida has increased controls on mercury releases through:

**Pollution Prevention** -- Florida's solid waste law requires mercury to be eliminated from some commercial products. Other provisions ban mercury in packaging, prohibiting incineration of mercury-containing lamps and devices, promote recycling, and phase out the use of mercury batteries.

**Waste Disposal** -- Hazardous waste regulations now require stricter control of wastes that contain mercury. Proper disposal minimizes the long-term releases of mercury into the environment. An unintended but beneficial side effect of stricter regulation is to encourage elimination of mercury from some commercial products and industrial processes.

**Emissions Control** --A 1991 emissions inventory for Florida found that the major sources of mercury to the atmosphere were municipal solid waste incinerators, electric utilities, and medical waste incinerators. Under the authority to control toxic air emissions the DEP has adopted the first US rules to

limit emissions of mercury from municipal solid waste incinerators.

Although aggregate emissions of mercury from incinerators are small in comparison to the global mercury budget, facilities in south Florida emit amounts that maybe significant for the region. Proven cost-effective control technology is available, and will be required of these facilities when necessary to comply with standards, although some facilities may meet the new standard by recycling and waste control alone. Rules governing emissions from medical waste incinerators are under development.

## **Research**

We do not understand the dynamics of mercury in the atmosphere or its effects on aquatic systems in general, much less of the specific causes of the unusually severe problems in the Everglades. Before environmental controls can be developed to address the broader aspects of the problem, we must know the relationship between the sources, transport mechanisms and the dynamics of mercury in the watershed-sediment-waterbody-system.

The Governor's Mercury in Fish and Wildlife Task Force adopted a research plan to clarify these uncertainties. The research falls into three areas:

**Trend Monitoring** --To properly understand today's mercury problems, we must be able to put it into historical perspective. Have mercury burdens in fish truly increased, or are the high levels in bass from the Everglades a reflection of natural mercury in the organic soils of that area?

Studies elsewhere indicate that deposition from the atmosphere has increased 2-to 5-fold since the Industrial Revolution. But, while regional or local phenomena may cause differences, Florida seems to fit this pattern. Analysis of mercury in the Everglades sediments shows that mercury accumulation in the surface layer is about five times higher today than in 1900. Another research project will measure historical trends in Florida wildlife analysis of museum specimens.

Despite the insight that understanding historical trends gives us, perhaps the more urgent question is: Are mercury burdens of Florida fishes stable, increasing or decreasing? The Florida Game and Fresh Water Fish Commission is monitoring fish from several waterbodies to answer that question.

**Atmospheric Fluxes** -- Although we believe that much if not most of the broad-scale mercury problems are the result of airborne mercury, we have little reliable data on mercury in air or on deposition to the earth's surface.

Atmospheric concentrations of elemental mercury vapor are thought to be relatively uniform, but most of the good data is from remote sites at higher latitudes and may not be applicable to Florida as a whole or the South Florida region specifically. Relatively little work has been done on the emission, fate and transport of other forms of mercury in the atmosphere.

Before air sources can be invoked as the explanation for the particularly severe problems in the Everglades, we must first measure the distribution, over space and time, of atmospheric mercury burdens and deposition. To that end, a network of air monitoring stations--The Florida Atmospheric Monitoring Study--was built to measure mercury in the air, as well as wet and dry deposition.

The densest network is in south Florida--seven sites--to map the fine-scale relationships between the Everglades and several types of emissions sources. Two other sites will determine the importation of mercury into Florida from global or regional sources, and measure local atmospheric fluxes at the sites of aquatic studies.

This work needs to be complimented by intensive studies to measure and model mercury emissions and deposition from the urban areas of South Florida to estimate the proportion of the deposition that comes from local and regional sources. Other work will continue to refine emissions estimates from Florida sources and examine emerging technological options for emissions controls.

**Aquatic and Wetlands Studies**--The Everglades mercury problem, as opposed to that of lakes and rivers elsewhere in Florida, likely has somewhat different causes, requiring separate studies of these different

types of aquatic systems. The initial effort in the Everglades is to develop a finer picture of where mercury *is* in Everglades water, sediment, and biota by random sampling in canals and marshes, augmented by monitoring inputs and outputs to the system to construct a crude mass balance. Together, these should help develop additional hypotheses about the causes of the Everglades' unusually severe mercury problem.

More intensive, process-oriented studies will be done at the Everglades Nutrient Removal Project, a 2,740-acre experimental treatment area. These studies will begin with the determination of a precise mercury budget for the Project, and go on to process-oriented studies in test cells that permit replication and control of water and chemistry variables.

Other work will concentrate on mercury cycling in lakes and streams for later application to the Everglades.

Additional studies will determine long-term trends of mercury accumulation in sediments; interactions between the watershed, air, sediments and water; the changes in the chemical forms of mercury within the waterbodies; how this affects its uptake into fish and other aquatic organisms; and what risk this poses to wildlife and man.

The planned research will be pursued through a state-federal-private consortium with total funding needs of \$12-15 million over 5 years. About a third will come from federal agencies, one third from private sources, and the balance from state sources.

**For Further Information**, please contact Thomas D. Atkeson, PhD., DEP Mercury Coordinator, (904) 921-0884. For information about the Mercury Health Advisories, contact Roger Inman, HRS Toxicology and Hazard Assessment Program, (904) 488-3385.

6/22/94

Name \_\_\_\_\_

## Florida Wildlife Center-Biological Magnification

### Biological Magnification

Certain Pesticides and heavy metals that are not easily broken down or eliminated from living things are retained in an organism's body. The higher an organism is in the food chain, the higher its concentration of DDT. DDT, an agricultural pesticide banned in the US in the 1970's, accumulated in the tissues of predatory birds such as pelicans, hawks, and eagles. The high levels of DDT caused the birds to have reproductive problems such as thin-shelled eggs. The fragile eggs, unintentionally cracked by the incubating parents, resulted in the death of the developing chicks.

United States migratory birds, wintering in foreign countries, still encounter DDT poisoning. Although DDT has been banned in the US, it is still produced here and sold to many foreign countries where it is not illegal to use on crops and for mosquito control.

In Florida high levels of mercury, thought to be caused by atmospheric deposition, have been found in some freshwater ecosystems. Atmospheric deposition occurs naturally (outgassing from oceans, volcanoes and mercury deposits) and from human related sources (coal combustion, waste incineration, chloralkali and metal processing). In 1989 an Everglades Florida Panther's death was attributed to mercury poisoning.

1 How do you think the panther's level of mercury got so high?

2 Why is it recommended, by the Florida Department of Health, that a person not eat more than one serving per week of certain species of fish caught in Florida freshwater ecosystems found to have high levels of mercury?

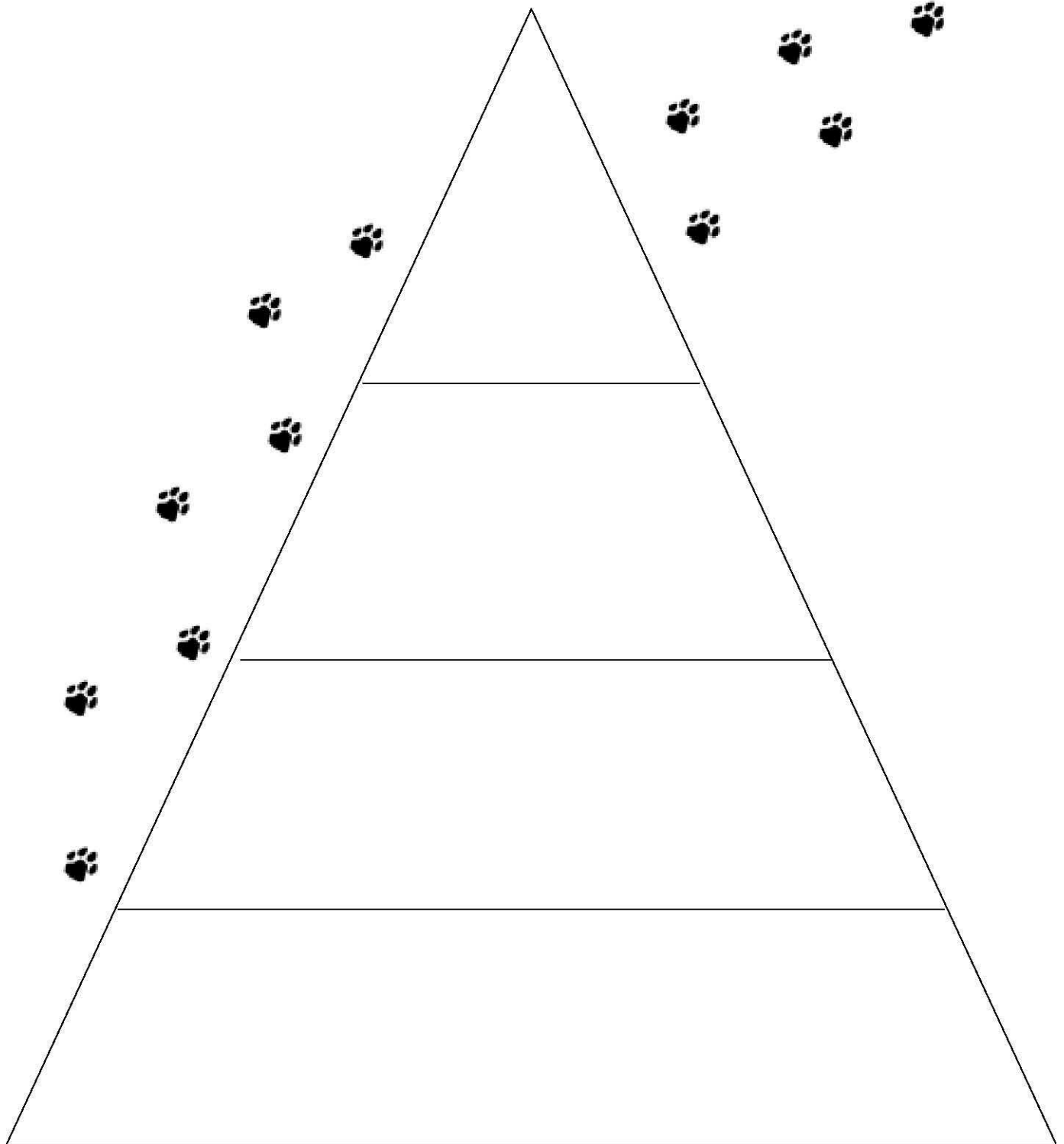
As you walk through the Florida Wildlife Center complete the data table below. After completing the data table, place your organisms in the proper level of the food pyramid on the next page.

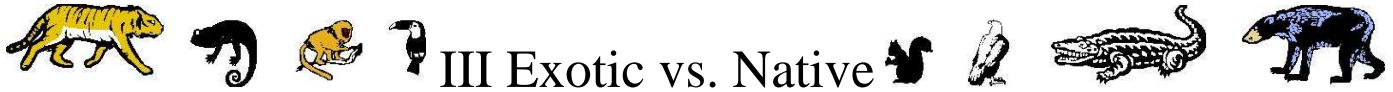
Type	Organisms in the Florida Wildlife Center
Producer	
Primary Consumer	
Secondary Consumer	
Tertiary Consumer	

List any decomposers you were able to observe. \_\_\_\_\_

FLORIDA WILDLIFE CENTER – BIOLOGICAL MAGNIFICATION, CONT.

Arrange the organisms from your lists into an ecological pyramid by writing the names of the organisms at the appropriate level.





### III Exotic vs. Native

**Purpose:** To identify the influences of exotic species in a Florida environment

**Objective:** To use the Lowry Park Zoo to compare and identify exotic and native species of plants and animals.

Benchmarks: SC.G.1.4.1, SC.G.2.4.2, SC.G.2.4.3, SC.G.2.4.6

**Materials:**

1. "Reckoning with the Dirty Dozen", (Florida Water, Fall / Winter 1997, pp. 20 - 21, SWFMD, Public Domain)
2. State of Florida Department of Environmental Protection, Environmental Education Leaflet #7 -Invading Exotic Species in Florida", (Public Domain)
3. Worksheet "Exotic vs. Native"
4. Pencil or Pen and a clipboard when you go to the Zoo.

**Pre-Visit:**

- 1 Discuss the difference between native and exotic species.
- 2 Students should read "Reckoning with the Dirty Dozen", pp. 10 - 11.
- 3 Students should read State of Florida Department of Environmental Protection, "Environmental Education Leaflet #7", pp. 12 - 13.

**Visit:**

1. Students should complete the worksheet "Exotic vs. Native", p. 14

**Post Visit:**

Have the students write a 16-line FCAT response based upon the information from their readings worksheets, and research, to the following question : What would be the response to the Florida system if you substituted your ten exotic plants and/or animals for ten native plants and/or animals?

**Fast Fact:** According to the United States Geological Survey of non-indigenous aquatic species, Florida has 13 species of non-indigenous amphibians, 16 species of non-indigenous aquatic reptiles, 135 species of non-indigenous fish, 1 species of non-indigenous mammals and over 42 species of non-indigenous aquatic plants.



## Reckoning with the Dirty Dozen

Twelve categories of exotic plant species top an inter-district list for management and control. Florida Water ·  
Fall/Winter 1997, pp 20-21 By C. Dean Rusk

Rapid urbanization across the state places pressure on remaining undeveloped areas to support the natural habitats which make Florida unique. Through programs such as *Save Our Rivers*, *Preservation 2000*, *Conservation and Recreation Lands (CARL)* - among others - state agencies strive to keep pace by preserving and protecting environmentally sensitive lands.

As land managers look over their shoulders, they find, yet, another fast-growing problem defacing the landscape. Encroachment of highly invasive, exotic plant species poses substantial hazards to the balance and survival of native plant communities. These include alteration of natural fire and flooding patterns, navigational obstruction, and even decimation of entire native habitats. Once established, a successful, small unchecked colony can spread to large-scale infestation. To compound our problem, Florida is the only region in America where temperate, subtropical and tropical species actually coexist – creating an environment of exponential threat from exotics of all three climatic zones.

Simply put, native species coevolved with parasites, herbivores, diseases and climate, achieving equilibrium within an established community. They are defined as those species occurring before European settlement.

Exotic species are those non-native species, introduced both intentionally, for example to prevent erosion or as an ornamental, and unintentionally, for instance, as an escape from cultivation.

But the variable threat for disruption of a balanced system occurs when an exotic species can proliferate and actually out-compete native plants, hence becoming invasive to an established community.

In 1996, an Inter-District Exotic Plants Committee was formed to assess and present efforts for the management of exotic species. In May 1997, the committee issued its report, *Exotic Plant Invasion on Florida's Water Management District Lands*. This cooperative inter-district report describes actions taken by the water management districts, and identifies the "dirty dozen" – a short list of the most destructive exotics on public lands under stewardship of the water management districts.

The districts' goals are to eliminate populations, or adequately control invasive exotics while minimizing costs and not adversely impacting natural resources. Standardized inventories, management plans and practices, public partnerships, legislation and education are strategies being used and under development to help achieve maintenance control.

To learn more about exotic invasives, visit your local library, browse the Web, or write the Inter-District Exotic Plants Committee. You may request a free copy of its report or address queries to committee chair Tony Richards at the Southwest Florida Water Management District.



(Skunk Vine infestation)

## Just what are the Dirty Dozen?

First, they're not a dozen at all! Twelve categories were created from these 15 exotic species to aid public awareness.

1. Brazilian Pepper – out-competes native species, including mangroves in saltwater habitats.
2. Melaleuca – quickly displaces native vegetation; extremely flammable; disrupts water flow.
3. Japanese and Old World Climbing Fern – blankets native tree canopy, shading and eliminating understory; acts as a “fire ladder”.
4. Skunk Vine – blankets canopy and ground cover; weight and proliferation of vine may kill canopy and sub-canopy trees; acts as a “fire ladder”.
5. Tropical Soda Apple – occurs in high densities, displacing native vegetation.
6. Cogon and Torpedo Grass – displacement of native vegetation; cogon grass is extremely flammable, creating intense heat, destroying native species which would normally survive fire.
7. Australian Pine – quickly colonizes beach dune communities, excluding all other plant species; root system may preclude sea turtle nesting.
8. Waterhyacinth and Hydrilla – forms water surface canopy mat, prohibiting sunlight, lowering dissolved oxygen, out-competing natural vegetation.
9. Air Potato – blankets native tree canopy, shades understory.
10. Chinese Tallow – displaces native species, nutrient load of leaf drop; leaf litter may be toxic to invertebrates.
11. Waterlettuce – surface mat prohibits sunlight and lowers dissolved oxygen, resulting in displacement of native vegetation.
12. Kudzu – blankets canopy; weight and proliferation of vine may kill canopy and sub-canopy trees, as well as understory vegetation.

State of Florida Department of Environmental Protection  
Environmental Education Leaflet # 7 – Invading Exotic Species in Florida

Exotics in Florida

Florida is unwilling host to hundreds of exotic plants and animals, and is threatened with invasion by scores of others.

What is an exotic species? An exotic or non-indigenous species is a plant or animal which may survive and reproduce here, displacing native species and altering native ecosystems.

In some cases exotic species seem to cause little or no obvious damage, appearing only as weeds in our gardens or along roadsides, or (as in the case of the monk parakeet) as noisy oddities in our urban landscapes. In other cases, (such as Melaleuca or Brazilian pepper) the invaders push out native plants and animals, reduce biodiversity, and destroy ecosystems, drinking up our water supplies.

They are cause for economics as well as ecological concern. The table lists a few of the most notorious of Florida's exotic invaders and their effects on Florida's natural systems.

**Selected Exotic Plants and Animals in Florida Plants**

<u>Name</u>	<u>Effects/Area Infested</u>
<b>Australian Pine</b>	373,723 acres. Their ability to quickly colonize disturbed Area displaced native species.
<b>Melaleuca</b>	488,824 acres. Explosive growth habits and the ability to form dense stands crowds out native plants.
<b>Hydrilla</b>	100,000 acres. Produces a dense mat at the surface, shading out bottom vegetation, creating low dissolved oxygen levels, and affecting animal life.
<b>Brazilian Pepper</b>	703,504 acres. Birds spread the seeds of this invasive species. It displaces native understory plants and affects bird population densities.
<b>Cogon Grass</b>	Established in at least 27 different Florida Counties. Dense growth can affect the intensity of fires.
<b>Chinese Tallow</b>	A native of China, it invades bottomland hardwood forests and wetlands. May replace native species. Leaf litter can be toxic to invertebrates.
<b>Torpedo Grass</b>	17,544 acres. It completely displaces native vegetation along waterfronts. Little or no habitat value.
<b>Kudzo</b>	2 million acres in the Southeast. It is spreading in Florida. Kudzu may crowd out native vegetation.
<b>Tropical Soda Apple</b>	Forms dense single-species stands in agricultural and pasture lands, ditch banks and roadsides. Threatens natural areas with invasion.
<b>Waterhyacinth</b>	1,680 acres. In the 1950's waterhyacinth covered more than 120,000 acres of Florida
<b>Catclaw Mimosa</b>	Although it now only infests less than 1,000 acres in five locations in South Florida, catclaw mimosa is a distinct threat to the Everglades, where it could obstruct waterflow.

There are only a few of the more than 1000 alien plant species that have become established in Florida, infesting more than 1.5 million acres of land.

<b>Animals (Insects)</b>	
Name	Problems/Effects
<b>Fire Ant</b>	Kills young citrus transplants, is a serious pest to fruit pickers in infected groves, can eliminate native ants and affect densities of other insects.
<b>House Fly</b>	Each of these immigrant fly species
<b>Horn Fly</b>	are major insect pests for livestock and
<b>Stable Fly</b>	all are resistant to most chemical pesticides.
<b>W.I. Sugarcane Rootborer</b>	Attacks roots of citrus trees, damaging the tree.
<b>Fruit Flies</b>	Can cause significant damage to citrus fruits
<b>Citrus Leafminer</b>	May defoliate citrus trees.
<b>Cactoblastis cactorum</b>	This moth causes severe damage to native prickly pear cacti (Opuntia)
<b>Mosquitoes</b>	Four mosquitoes – Aedes aegypti, A. albopictus, A. bahamensis, and Culex quinquefasciatus create public health and nuisance problems in Florida.

More than 1,000 non-native insects have found their way to Florida and have become established. Many are important pests.

<b>Animals (Fish)</b>	
Name	Problems/Effects
<b>Flathead Catfish</b>	May have adverse effect on native fishes in Panhandle.
<b>Blue Talapia</b>	Has become the dominant fish in some waters where it has established. However, a small commercial fishery also has become established.
<b>Common Carp</b>	Contributes to siltation.
<b>Walking Catfish</b>	An oddity

No native fish have been extirpated by exotic introductions into Florida—yet. Most exotic fishes arrive through State of Florida Department Protection

Environmental Education Leaflet # 7 – Invading Exotic Species in Florida

<b>Animals (Reptiles and Amphibians)</b>	
Name	Found At/Impact, if any
<b>Giant Matine Toad</b>	Common in Miami-Key West.
<b>Cuban Treefrog</b>	Invades natural areas along lower East Coast. Preys on native treefrogs.
<b>Greenhouse Tree Frog</b>	Widespread in Florida. Can replace native species.
<b>Spectacled Caiman</b>	Locally common in S. Dade freshwater canals and ponds.
<b>Various Gekkos</b>	Found in South Florida. Some species are aggressive and many prey on native species.
<b>Boa Constrictor</b>	Breeding in south Dade county.

Exotic reptiles and amphibians have adverse effects on Florida ecosystems. Some species may prey on or crowd out native species. A few toads may pose a human threat from toxins in their skins. The boa constrictor and other (as-yet-unestablished in Florida) large snakes represent a threat to domestic animals, native wildlife, or even small children.

**Animals (Mammals)**

Name Found at/Impact, if any

<b>Feral Pig</b>	Rooting feral hogs have the most destructive effects on natural habitats of all of the exotic mammals. Feral hogs are found through Florida and are an important source of food for panther, black bear and alligator.
<b>Rhesus Monkey</b>	Colonies on islands in the Florida Keys have severely degraded the mangrove community. Other colonies can become nuisances. The monkeys carry Simian Herpes B. Virus, which can be fatal to humans.
<b>Armadillo</b>	The nine-banded armadillo is found throughout Florida. Its foraging often disturbs natural and agricultural habitat.
<b>Coyote</b>	The coyote is established throughout Florida, but is perhaps more common in the north. The coyote is a predator on native species.
<b>Feral Cats</b>	Domestic cats gone wild are common in Florida. They prey on native species and threaten birds.

Twenty-three species of mammals have become established in Florida. Three others may be on their way.

**Animals (Birds)**

Name Found At/Impact, If any

<b>Rock Doves</b>	Rock doves are the pigeons in the city park. So ubiquitous that they might as well be native, they are pests, and foul statuary and buildings with their droppings.
<b>Parakeets</b>	Three species of pet trade parakeets have established colonies along the southern coasts of Florida. Generally, they are little more than noisy urban nuisances.
<b>House Finch</b>	This western bird seems to be arriving in Florida. It nests in Leon, Escambia and Okaloosa counties. Elsewhere in the U.S. they are agricultural pests.
<b>Muscovy Ducks</b>	These large ducks can become nuisances around urban pond.

Only eleven exotic birds have become established in Florida, but another dozen—including five parakeets, a parrot and a macaw – seem poised to join them.

**Animals (Invertebrates)**

Name Found at/Impact, if any

<b>Asiatic Clan</b>	Displaces native mussels, disrupts habitat, clogs hydro-installers.
<b>Spiketopped Applesnail</b>	Displaces native apple snails. Is not eaten by snail kite.
<b>Melania (snails)</b>	Three species. Carriers of Human & Avian lung fungus.

Three species seem poised to invade Florida are of special concern: The **brown tree snake** (S. Pacific), the **African honeybee** (via S. America) and the **zebra mussel** (Europe via the northern U.S.)

The aggressive, poisonous brown tree snake has devastated the ecology, economy, and quality of life in Guam. It can eliminate its competition and wreak havoc on the native small mammals. It invades homes, hotels and commercial buildings, and climbs power poles, shortening out electrical power supplies. It often stows away in aircraft and ships out of Guam. Broader distribution seems likely.

The African honeybee will compete with existing managed bees. They are aggressive and sting readily when disturbed so pose a health hazard. It is already in Texas and Arizona.

The zebra mussel has choked intake structures and displaced native species throughout the Mississippi River drainage system. It has reached Alabama.

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Source: An Assessment of Invasive Non-Indigenous Species in Florida's Public Lands.  
Department of Environmental Protection, Tallahassee, 1994. For further information, call Don C.  
Schmitz at Tom Brown, Bureau of Aquatic Plant Management, at (904) 488-5631. Releases from the  
aquarium trade.



## Exotic vs. Native

Identify ten native plants/animals, and ecosystems they are found in, using the Florida Wildlife Center at Tampa's Lowry Park Zoo.

Common Name	Scientific Name	Ecosystem
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Identify ten exotic plants/animals, and ecosystems they are found in, using any other exhibit of your choice at the Tampa's Lowry Park Zoo. Exhibit \_\_\_\_\_ (Ex. Asian Domain)

Common Name	Scientific Name	Ecosystem
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

## IV. Endangered Species



**Purpose:** To introduce students to environmental factors that threaten or endanger nature.

**Objective:** The students will be able to identify endangered/threatened species and reasons for the status of the species.

### **Materials:**

- 1 Worksheet "Endangered/Threatened Species"
- 2 Optional -disposable or digital camera
- 3 Pencil or Pen and a clipboard when you go to the Zoo.

### **Pre -- Visit:**

1. Discuss endangered and threatened species.

### **Visit:**

- 1 Students should complete "Endangered/Threatened Species" worksheet, page 16.
- 2 Optional - Identify and photograph endangered and threatened species to use in optional post-visit activity.

### **Post Visit:**

Optional: Students are to make a presentation on one or more of the endangered or threatened species. This presentation is to include a picture of the animal, name, ecosystem, cause of threat or endangerment, and a 16 line FCAT response to the following question: How would you propose the rescue of your species? This is to be presented to the class as a poster, or Power Point presentation.

**Fast Fact:** Within the last century the reasons for extinction, in descending order, are as follows: destruction of habitat, displacement by introduced species, alteration of habitat by chemical pollutants, hybridization with other species / subspecies, and over harvesting.

Name: \_\_\_\_\_ Endangered and Threatened Species

The Lowry Park Zoo has many endangered & threatened species, both native and non-native, in its animal habitats. Visit the habitats of the following endangered & threatened species, observe them, and find out why these animals are endangered.

<b>Asian Domain</b>	<b>Reason for Status</b>
Indian Rhino	
Malayan Tapir	
Clouded Leopard	
Babirusa	
<b>Primate World</b>	<b>Reason for Status</b>
Golden-headed Lion Tamarin	
Lemurs	
Siamang	
Mandrill	
Chimpanzee	
Bornean Orangutan	
<b>Florida Wildlife Center</b>	<b>Reason for Status</b>
Bald Eagle	
Red Wolf	
Florida Panther	
West Indian Manatee	
<b>Safari Africa/Safari Ride</b>	<b>Reason for Status</b>
White Rhino	
Southern Hornbill	
African Elephant	
Aldabra Tortoise	
Blue Duiker	
Cheetah	
<b>Wollaroo Station</b>	<b>Reason for Status</b>
Flying Fox Bat	

What are the two main reasons the above animals are endangered?

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## ENDANGERED &amp; THREATENED SPECIES

The Lowry Park Zoo has many endangered & threatened species, both native and non-native, in its animal habitats. Visit the habitats of the following endangered & threatened species, observe them, and find out why these animals are endangered.

<b>Asian Domain</b>	<b>Reason for Status</b>
<i>Indian Rhino</i>	<i>poaching for horn and hooves</i>
<i>Clouded Leopard</i>	<i>Habitat destruction and extensive poaching</i>
<i>Babirusa</i>	<i>habitat destruction and excessive hunting</i>
<b>Primate World</b>	<b>Reason for Status</b>
<i>Golden-headed Lion Tamarin</i>	<i>destruction by humans of lowland rainforests</i>
<i>Lemurs</i>	<i>habitat destruction, commercial exploration</i>
<i>Siamang</i>	<i>hunting and habitat destruction</i>
<i>Mandrill</i>	<i>hunted and habitat loss</i>
<i>Chimpanzee</i>	<i>hunted, traded, habitat destruction</i>
<i>Bornean Orangutan</i>	<i>habitat loss due to logging operations</i>
<b>Florida Wildlife Center</b>	<b>Reason for Status</b>
<i>Bald Eagle</i>	<i>destruction of nesting areas and DDT</i>
<i>Red Wolf</i>	<i>killed during the federal predator control program</i>
<i>Florida Panther</i>	<i>illegal hunting, road kills, insufficient prey, health problems</i>
<i>West Indian Manatee</i>	<i>boat collisions, poaching, cold weather, red tide</i>
<b>Safari Africa</b>	<b>Reason for Status</b>
<i>White Rhino</i>	<i>poached for horn and hooves</i>
<i>Southern Hornbill</i>	<i>habitat destruction, slow/low birth rate</i>
<i>African Elephant</i>	<i>ivory trade/habitat destruction/increased agriculture</i>
<i>Aldabra Tortoise</i>	<i>large numbers concentrated in one area increase risk of decimation by disease/natural disasters</i>
<i>Blue Duiker</i>	<i>hunted for their skins, killed by farmers, food supply being depleted</i>
<i>Cheetah</i>	<i>High death rate of cubs, hunted for their skins, habitat destruction</i>
<b>Wallaroo Station</b>	<b>Reason for Status</b>
<i>Flying Fox Bat</i>	<i>Poison, hunted for its fat for medicinal purposes, loss of habitat</i>

**What are the two main reasons the above animals are endangered?**

*Habitat loss and accept any answers from above that are repeating*

## V. Biomes and Ecosystem

**Purpose:** To identify the characteristics of various biomes and ecosystems.

**Objective:** Compare and contrast local biomes, niches, communities, and

**Benchmarks:** SC.G.1.1, SC.G.2.4.4

**Materials:**

1. Chart-“Biomes and Ecosystems of Florida”
2. Pencil or Pen and a clipboard when you go to the Zoo.

**Pre -- Visit:**

1. Review the definitions for biomes and ecosystem.

**Visit:**

1. Complete the “Biomes and Ecosystems of Florida” chart.

**Post-Visit:**

Students should construct a Venn diagram comparing and contrasting Florida ecosystems to Asian ecosystems. Students should use their charts and give specific examples.

**Fast Fact:** The main ecosystems inhabited by several of Florida’s endangered species, including the Florida panther, gopher tortoise, indigo snake, and re-cockaded woodpecker, are enhanced by burning.



Name \_\_\_\_\_

## Biomes and Ecosystems of Florida

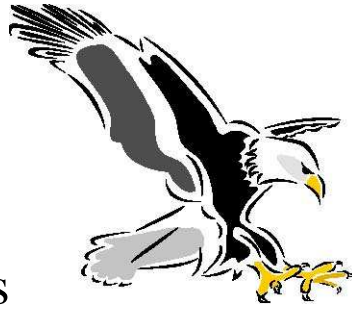
A biome covers a large geographic region with similar climate. Each biome is comprised of several different types of ecosystems, each of which is influenced by soil type, topography, rainfall pattern, and biological inhabitants. Although Florida has a humid, subtropical climate, variation in abiotic and biotic factors creates twenty-six distinct ecological communities. As you tour the Florida Wildlife Center you will pass through several of these communities, each distinct in its flora, fauna, and value. Begin your visit at the entrance to the Florida Wildlife Center behind the Cracker Shack.

Fill in the chart below as you view the Florida Wildlife Center at Tampa's Lowry Park Zoo.

ECOSYSTEM	PLANTS/ANIMALS	DESCRIPTION, including value if available
Upland Hardwood Hammock		
Cypress Swamp and Dome		
Wetlands		
Inside Manatee/Aquatic Center		
Mangrove Swamp		
Spring and River		
Reefs – Deep Fore, Fore, & Crest		
Estuary		

## Biomes and Ecosystems of Florida, page 2

ECOSYSTEM	PLANTS/ANIMALS	DESCRIPTION, including value if available
Tropical Hammock		
Xeric Oak Hammock		
Sandhill		
Bog		
Human Habitation & Trash Pile		
Field & Disturbed Areas		
Mesic Hammock		
Temporary Pond & Roadside Ditch		
Freshwater Marsh		
River and Stream		
Cypress Swamp		
Exit Manatee/Aquatic Center		
Pine Flatwoods		
Dry Prairie		
Marsh		



## VI. Bird Adaptations

**Purpose:** To introduce students to the concept of form equals function.

**Objectives:** Understand how various adaptations could be beneficial or detrimental to an animal, depending on the environment.

**Benchmarks:** SC.F.1.4.2

**Materials:**

1. "Bird Adaptation Worksheet"
2. Optional post activity - disposable or digital cameras, materials to construct mobile (poster board, glue, string, tape, markers, etc.).
3. Pencil or Pen and a clipboard when you go to the Zoo.

**Pre-Visit:**

1. Present the concept of "structure determines function" to students.

**Visit:**

1. Students should complete "Bird Adaptation Worksheet", page 22.
2. Optional - Take pictures of one or more birds to create a mobile as a post activity.

**Post-Visit:**

1. Students will submit "Bird Adaptation Worksheet".
2. Students will construct a mobile. See page 23. Suggestions for grading:
  - a. creativity
  - b. neatness
  - c. accuracy
  - d. aesthetics

**Fast Fact:** The fastest creature on earth is the Peregrine Falcon, which in a dive, will reach speeds greater than 200 miles per hour.

Name \_\_\_\_\_

## BIRD ADAPTATION WORKSHEET

A wide variety of adaptations allow birds to fill virtually every niche in an ecosystem. The type of beak determines a bird's diet and the structure of a bird's foot determines what type of habitat it can occupy. A bird's coloration is also an important adaptation. Some plumage allows for camouflage, while brightly colored plumage, often indicating fitness, can be useful for attracting mates.

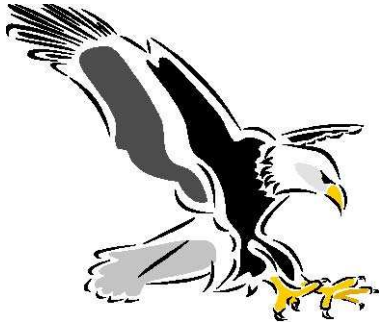
As you walk through the Free Flight Aviary at the Lowry Park Zoo, observe the birds and read the signs to obtain the information for data table A. Then select five birds from data table A and complete data table B.

Data Table A-Bird Adaptations

<b>Body Structure</b>	<b>Adaptation for:</b>	<b>Bird</b>
Short and stout beak	cracking seeds and nuts	
Chisel-shaped beak	breaking into tree bark for insects	
Spear-shaped beak	spearing fish	
Hooked beak	tearing animal tissue	
Pouch-like beak	holding fish	
Slender, long, slightly curved, tubular beak	probing flowers for nectar	
Long, strong, flexible beak	probing for soft-ground food	
Short, pointed, trap-like beak	catching insects in midair	
Large, forward-looking eyes	binocular and night vision for spotting prey	
Long, powerful legs	running, defense ( kicking)	
2 front toes/2 back toes	holding onto side of tree without falling back	
3 toes front/1 long toe back	perching on branches	
3 front toes/1 back toe (long toes; large foot)	wading; walking on mud; walking on sand	
3 front webbed toes/1 back toe	swimming	
3 toes front/1 back toe (large curved claws)	catching, grasping, and carrying prey over distances	

Data Table B

<b>Bird</b>	<b>Habitat</b>
1	
2	
3	
4	
5	



Name \_\_\_\_\_

## Mobile Construction

Objective: To dynamically display the basic adaptations of various species of birds

Your Mobil should be colorful, three dimensional, and creatively express the bird you choose. Once you have selected your bird from the Aviary, you will need to answer the following questions; What type of beak does your bird have, what type of feet, coloration of body (male, female, immature), what type of food does your bird eat, and what habitat does your bird reside in? Your Mobile should be designed so that no matter what direction it turns you will be able to view all of these questions and their answers.

Use the picture you took at the Lowry Park Zoo, or any other picture of the bird you select, as your top level of the mobile. Draw a picture of each of the five lower levels of the mobile (beak type, foot type, coloration – draw a feather, food type and habitat) on the poster board. On the other side of each picture, answer the corresponding question from above.

Be creative, use yarn, ribbon, noodles, beads, drawings, photographs, multi - textured, multi-colored or multi-layered paper. Use scissors with fancy edges, glitter, paint, colored glue, etc. You may use a hanger or dowel rods, to suspend your project. Create a work of art that is biologically accurate and a useful learning tool for the classroom.

Bird  
Name  
Scientific Name

Beak Type

Food Type

Coloration

Food Type

Habitat (nest or tree, stream, etc.)



## VII Make an Animal

**Purpose:** To introduce the students to the concept of structure determines function.

**Objectives:** The student will understand how various adaptations could be beneficial or detrimental to an animal, depending on the environment.

**Benchmarks:** SC.F.1.4.2, S.C.F.2.4.3

### Materials

- 1 "Make an Animal Sketchpad" worksheet, pp. 25 & 26.
- 2 Optional: Digital camera with zoom lens.
- 3 Suggested reference : After Man, A Zoology of the Future, Dougal Dixon © 1998, Eddison Sadd, ISBN 0-312-19433-1
- 4 Pencil or Pen and a clipboard when you go to the Zoo.

### Pre-Visit:

1. Go over instructions for the "Make An Animal Sketchpad", pp. 24 & 25. If using digital cameras, go over any instructions necessary to use the cameras

### Visit:

1. Students should complete the "Make An Animal Sketchpad", pp. 24 & 25. If using digital cameras, students may take pictures instead of drawing on the sketchpad.

### Post-Visit:

1. Using the drawings from the sketchpad or photographs taken with the digital cameras, students are to create an animal. You may also have students give a description of the ecosystem the animal should live in and tell what adaptations the animal has to make it fit to that environment.

**Fast Facts:** The structure of living things on our planet has been determined by two things: environment and evolution. As the environment changes, even at this very moment evolution continues.

## Make an Animal Sketchpad

As you observe the animals listed below, note the adaptations you see on the signs. Select adaptations from several of the animals you observe and draw them on your sketchpad. You will then make an entire animal from your collection of adaptations. Additional space has been left for you to add your own structures. **Asian Domain-** White Tiger, Bactrian Camel, Sloth Bear, Clouded Leopard, Asian Rhino, Babirusa **Primate World -**Geoffroy's Marmoset, Lemurs, Old World Comb Duck, Angolan Colobus, Yellow-Spotted Side-Neck Turtle, Black Howler Monkey, Mandrill, Chimpanzee, Bornean Orangutan **Safari Africa-**Dromedary Camel, Wart Hog, Grant's Zebra, East African Crowned Crane, Meerkat, Kudu, Okapi, Cheetah

Structure	Animal	Function of Adaptation	Sketch
Feet			
Legs			
Body Shape			
Body Covering			
Color			

## Make an Animal Sketchpad, continued

Structure	Animal	Function of Adaptation	Sketch
Face			
Head Shape			
Ears			
Eyes			
Tail			
Other			



## VIII. Scavenger Hunts

**Purpose:** Students identify animals by adaptations, native ecosystems and geographic regions, conservation status and reason for status.

**Objectives:** Observe animals and identify them by their physical and behavioral adaptations.

**Benchmarks:** S.C.F.1.4.2, S.C.F.2.4.3

### Materials

1. Pencil or Pen and a clipboard when you go to the Zoo.
2. Copies of scavenger hunts for the following areas of the Tampa's Lowry Park Zoo:
  - a. Manatee and Aquatic Center
  - b. Asian Domain
  - c. Free-Flight Aviary
  - d. Primate World
  - e. Safari Africa/Safari Ride

### Pre-Visit:

1. No activity required

### Visit:

1. In this section there are "Scavenger Hunts" for five regions of Tampa's Lowry Park Zoo. The "Scavenger Hunts" utilize clues that require the students to both observe the animals and read the graphics corresponding to the animal habitats. Most clues include a physical adaptation or sometimes a behavioral adaptation. Other clues focus on the animal's conservation status and the reason for that status. Geographic locations are also used as deciding factors in some of the clues.
2. Students can complete the "Scavenger Hunts" individually, in pairs, or in small groups.

### Post Visit:

Check this activity when student return to the classroom.

### Fast Facts:

Organisms possess many traits that are neutral. When an environmental change occurs, if a trait increases a species' potential to successfully reproduce in that specific environment, the trait becomes an adaptation.

## Manatee and Aquatic Center Scavenger Hunt

1. There are six species of poisonous snakes that can be found in Florida, in this exhibit.
  - a. This one is the smallest and even though its venom is potent, it rarely enough to cause human fatalities. \_\_\_\_\_
  - b. This pit viper is easily recognized by its diamonds. \_\_\_\_\_
  - c. This snake has warning colors of red and yellow and the colors of its head distinguish it from the harmless scarlet snake. \_\_\_\_\_
  - d. This snake, with a rusty stripe along its back, is usually found only in north Florida mesic forest. \_\_\_\_\_
  - e. This poisonous snake is mostly active at night, and its shades of brown camouflage in the leaf litter. \_\_\_\_\_
  - f. This water snake has a dark band across its cheek. \_\_\_\_\_
2. These snake-like amphibians are aquatic. Look for two toes on the tiny front appendages of one and the feathery fills on the other. \_\_\_\_\_
3. These reptiles' bodies are adapted for life in the trees where food is abundant. \_\_\_\_\_
4. This terrestrial reptile can close itself in its shell when threatened. \_\_\_\_\_
5. Most fish can only breathe oxygen from the water but this one can use its air bladder, which opens to its throat, to gulp in oxygen from the surface of the water. \_\_\_\_\_
6. This primitive fish inhabits calm water where it remains motionless waiting for prey. Its long, many toothed, snout allows it to catch and hold prey. \_\_\_\_\_
7. With its whiskers, this fish can detect insects and worm in the sediments. \_\_\_\_\_
8. This fish is often mistaken for the anglefish but its vertical bars give it away. \_\_\_\_\_
9. The sharp spine folded along the tail of the fish can be used to slash another fish. \_\_\_\_\_
10. A "jeweled crown" of black ringed by blue is worn by the fish as it roves over the reef grazing on sponges and algae. \_\_\_\_\_
11. These cigar shaped fish can change from female to male. \_\_\_\_\_
12. This bi-colored fish is purple above, yellow below. Though the adults feed on crabs, urchins, brittle stars, the young clean ectoparasites off other fish. \_\_\_\_\_
13. During the day this fish hides in sheltered parts of the reef. At night, its big eyes allow it to see the crustaceans and other small invertebrates on which it feeds. \_\_\_\_\_
14. The majestic fish uses its caudal and anal fins to swim, its chisel-like teeth allow it to crush urchins, starfish and crabs. \_\_\_\_\_
15. The long, green, scales fish opens and closes its mouth, not to show aggression but to respire. \_\_\_\_\_
16. This fish is usually docile but can bite and hang on tenaciously if provoked. Identify it by the barbells on its chin. \_\_\_\_\_
17. The horizontal stripe marks the lateral line, used to detect movement in the water, of this fish. \_\_\_\_\_
18. This silver fish's large mouth gives away its predatory nature. It lives mainly in salt water but enters rivers to feed. \_\_\_\_\_

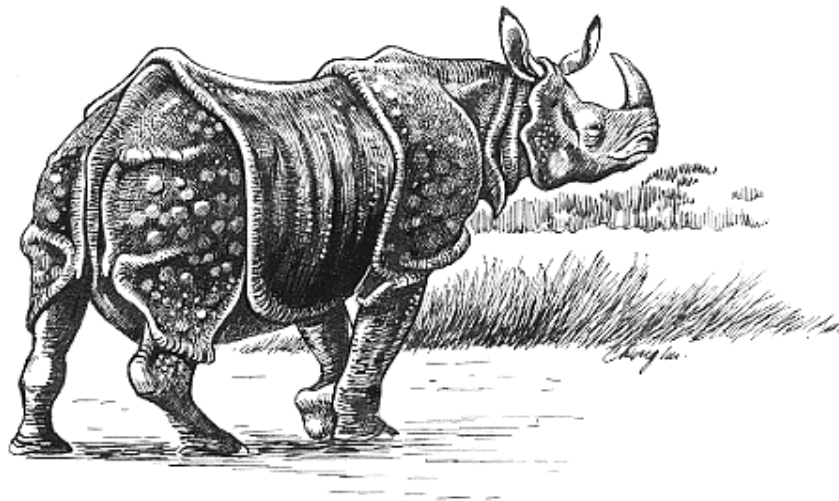
# Manatee and Aquatic Center Scavenger Hunt-Answer Key

1. There are six species of poisonous snakes that can be found in Florida, in this exhibit.
  - This one is the smallest and even though its venom is potent, it rarely enough to cause human fatalities. Dusky pygmy rattler
  - This pit viper is easily recognized by its diamonds. Eastern diamondback rattler
  - This snake has warning colors of red and yellow and the colors of its head distinguish it from the harmless scarlet snake. Coral snake
  - This snake, with a rusty stripe along its back, is usually found only in north Florida mesic forest. Canebrake
  - This poisonous snake is mostly active at night, and its shades of brown camouflage in the leaf litter. Copperhead
  - This water snake has a dark band across its cheek. Florida cottonmouth
2. These snake-like amphibians are aquatic. Look for two toes on the tiny front appendages of one and the feathery fills on the other. Two-toed amphibium and greater siren
3. These reptiles' bodies are adapted for life in the trees where food is abundant. Rat snake-yellow, red, gray, everglades
4. This terrestrial reptile can close itself in its shell when threatened. Box turtle/accept gopher tortoise
5. Most fish can only breathe oxygen from the water but this one can use its air bladder, which opens to its throat, to gulp in oxygen from the surface of the water. Bowfin
6. This primitive fish inhabits calm water where it remains motionless waiting for prey. Its long, many toothed, snout allows it to catch and hold prey. Gar
7. With its whiskers, this fish can detect insects and worm in the sediments. Brown bullhead catfish
8. This fish is often mistaken for the angelfish but its vertical bars give it away. Spadefish
9. The sharp spine folded along the tail of the fish can be used to slash another fish. Blue tang
10. A "jeweled crown" of black ringed by blue is worn by the fish as it roves over the reef grazing on sponges and algae. Queen angel
11. These cigar shaped fish can change from female to male. Wrasses
12. This bi-colored fish is purple above, yellow below. Though the adults feed on crabs, urchins, brittle stars, the young clean ectoparasites off other fish. Spanish hogfish
13. During the day this fish hides in sheltered parts of the reef. At night, its big eyes allow it to see the crustaceans and other small invertebrates on which it feeds. Black soldierfish/cardinalfish
14. The majestic fish uses its caudal and anal fins to swim; its chisel-like teeth allow it to crush urchins, starfish and crabs. Queen trigger
15. The long, green, scales fish opens and closes its mouth, not to show aggression but to respire. Moray eel
16. This fish is usually docile but can bite and hang on tenaciously if provoked. Identify it by the barbells on its chin. Nurse shark
17. The horizontal stripe marks the lateral line, used to detect movement in the water, of this fish. Snook
18. This silver fish's large mouth gives away its predatory nature. It lives mainly in salt water but enters rivers to feed. Tarpon

Name: \_\_\_\_\_

## Asian Domain Scavenger Hunt

1. These Asian beauties resemble “flying rainbows”. \_\_\_\_\_
2. This largest of all lizards, a national treasure of Indonesia, is endangered due to its limited range. It can attain 250 pounds and live. \_\_\_\_\_
3. This Indonesian native is endangered due to habitat destruction. The four tusks growing from its snout identify it. \_\_\_\_\_
4. This Asian carnivore is rarely found in the wild because although its coat is beautiful, it provides no camouflage making it easily spotted by prey. \_\_\_\_\_
5. This “oreo” herbivore dives under water when alarmed. \_\_\_\_\_
6. This long-clawed animal has a gap between its upper front teeth. This allows it to “vacuum” in termites. \_\_\_\_\_
7. This “armored” animal is on the brink of extinction due to superstitious beliefs on its horn having medical purposes. \_\_\_\_\_
8. This lean, mean desert machine can go without food for long periods because it stores fat in its humps. \_\_\_\_\_
9. This tiny Southeast Asian deer shares the habitat of the Tapir at the Tampa’s Lowry Park Zoo. \_\_\_\_\_



## Asian Domain Scavenger Hunt-Answer Key

1. These Asian beauties resemble “flying rainbows”. Lorikeets
2. This largest of all lizards, a national treasure of Indonesia, is endangered due to its limited range. It can attain 250 pounds and live . Komodo dragon
3. This Indonesian native is endangered due to habitat destruction. The four tusks growing from its snout identify it. Babirusa
4. This Asian carnivore is rarely found in the wild because although its coat is beautiful, it provides no camouflage making it easily spotted by prey. White tiger
5. This “oreo” herbivore dives under water when alarmed. Malayan tapir
6. This long-clawed animal has a gap between its upper front teeth. This allows it to “vacuum” in termites. Sloth bear
7. This “armored” animal is on the brink of extinction due to superstitious beliefs on its horn having medical purposes. Indian rhinoceros
8. This lean, mean desert machine can go without food for long periods because it stores fat in its humps. Bactrian camel
9. This tiny Southeast Asian deer shares the habitat of the Tapir at the Tampa’s Lowry Park Zoo. Mutjac

Name: \_\_\_\_\_

## Free-Flight Aviary Scavenger Hunt

1. This large SE Asian “horned” bird seals herself in a nest cavity to incubate the eggs.  
\_\_\_\_\_
2. This bird has a red spot, in the center of its chest, giving the appearance of a bloody wound.  
\_\_\_\_\_
3. What bird behavior helps produce vitamin D? \_\_\_\_\_
4. During incubation, how do birds seem to be able to sense egg temperature?  
\_\_\_\_\_
5. Since they do not have teeth, how do birds break up food?  
\_\_\_\_\_
6. The large brightly colored bill on this lowland rainforest bird is used for eating fruits, insects, and small reptiles. \_\_\_\_\_
7. What are you really seeing when you see blue or iridescent coloration on a birds?  
\_\_\_\_\_
8. This mammal eats fruit and flower nectar. It is native to Turkey, Cyprus, Pakistan, Egypt, and Sub Sahara Africa. Look for it up in the rafters of the treetops at the Tampa’s Lowry Park Zoo. \_\_\_\_\_
9. This bright red bird’s color is a result of carotene derived from crustaceans in its diet.  
\_\_\_\_\_
10. What structure do birds use to hatch out of the egg? \_\_\_\_\_
11. Birds are banded for identification and so zookeepers can observe a bird’s activity. How can you determine if a bird is male or female by its banding?  
\_\_\_\_\_

## Free-Flight Aviary Scavenger Hunt-Answer Key

1. This large SE Asian “horned” bird seals herself in a nest cavity to incubate the eggs. The male feeds her through a small opening in the nest cavity till the eggs hatch. Hornbill
2. This bird has a red spot, in the center of its chest, giving the appearance of a bloody wound. Bleeding heart dove
3. What bird behavior helps produce vitamin D? Sunning
4. During incubation, how do birds seem to be able to sense egg temperature? Receptors located in a patch of skin near the abdomen
5. Since they do not have teeth, how do birds break up food? By swallowing sand or pebbles which help the gizzards break food up
6. The large brightly colored bill on this lowland rainforest bird is used for eating fruits, insects, and small reptiles. Toucan
7. What are you really seeing when you see blue or iridescent coloration on a birds? Reflection of sunlight on feather
8. This mammal eats fruit and flower nectar. It is native to Turkey, Cyprus, Pakistan, Egypt, and Sub Sahara Africa. Look for it up in the rafters of the tree tops at the Tampa’s Lowry Park Zoo. Egyptian fruit bat
9. This bright red bird’s color is a result of carotene derived from crustaceans in its diet. African openbill stork
10. What structure do birds use to hatch out of the egg? Eggtooth
11. Birds are banded for identification and so zookeepers can observe a bird’s activity. How can you determine if a bird is male or female by its banding? Male banded on right leg/ female banded on left leg

Name: \_\_\_\_\_

## Safari Africa Scavenger Hunt

1. This interesting variety of antelope is crepuscular, meaning it is active both dawn and dusk. \_\_\_\_\_
2. The wattle - protruding patches of skin near this animal's eyes and throat - is a characteristic shared by its American relative the turkey. \_\_\_\_\_
3. The black rings around the eyes of this animal function as a protection against the sun's glare. \_\_\_\_\_
4. This hardy animal is well-adapted to desert life with its thick coat, and long eyelashes (sun protection), ability to close its nostrils against flying dust, thick calloused joints and chest (protection from hot desert sand when kneeling), and a hump to store fat (energy when food is scarce). \_\_\_\_\_
5. This animal's horns were once fashioned into trumpets by early humans. \_\_\_\_\_
6. This relative of the horse has wide set eyes enabling it to see almost directly behind itself, ever wary of predators. \_\_\_\_\_
7. The thick, leathery "warts" on this animal's head protect it during attack. \_\_\_\_\_
8. This animal is the tallest on earth measuring a whopping 16-18 feet. \_\_\_\_\_
9. This fancy avian has the most ornate plumage of all species. \_\_\_\_\_
10. The largest relative of the antelope earns its name by grazing near marshes or rivers, plunging in to escape predators. \_\_\_\_\_
11. This solitary animal resembles a zebra but is more closely related to a giraffe. \_\_\_\_\_
12. This bird's distinctive color pattern provides camouflage from predators looking down from the sky or up from under water. \_\_\_\_\_

**Fast fact:** The duiker is the only antelope variety to consume carrion as well as vegetation.

## Safari Africa/ Safari Ride Scavenger Hunt-Answer Key

1. This interesting variety of antelope is crepuscular, meaning it is active both dawn and dusk. Duiker
2. The wattle - protruding patches of skin near this animal's eyes and throat - is a characteristic shared by its American relative the turkey. Ground Hornbill
3. The black rings around the eyes of this animal function as protection against the sun's glare. Meerkat
4. This hardy animal is well-adapted to desert life with its thick coat, and long eyelashes (sun protection), ability to close its nostrils against flying dust, thick calloused joints and chest (protection from hot desert sand when kneeling), and a hump to store fat (energy when food is scarce). Dromedary Camel
5. This animal's horns were once fashioned into trumpets by early humans. Kudu
6. This relative of the horse has wide set eyes enabling it to see almost directly behind itself, ever wary of predators. Zebra
7. The thick, leathery "warts" on this animal's head protect it during attack. Wart hog
8. This animal is the tallest on earth measuring a whopping 16-18 feet. Giraffe
9. This fancy avian has the most ornate plumage of all species. East African Crowned Crane
10. The largest relative of the antelope earns its name by grazing near marshes or rivers, plunging in to escape predators. Waterbuck
11. This solitary animal resembles a zebra but is more closely related to a giraffe. Okapi
12. This bird's distinctive color pattern provides camouflage from predators looking down from the sky or up from under water. African Penguin

**Fast fact:** The duiker is the only antelope variety to consume carrion as well as vegetation.

Name: \_\_\_\_\_

## Primate Scavenger Hunt

1. This primate from central Africa is black with white hair on its shoulders and tail. The babies are born with white hair. \_\_\_\_\_
2. This dog-faced primate's barking is particularly vocal at dawn and dusk in Madagascar. \_\_\_\_\_
3. This ring-tailed species from Madagascar forms matriarchal family units of mothers, daughters and offspring. The males are subordinate to the dominant females. \_\_\_\_\_
4. This long haired ape from Borneo has shorter thumbs than gorillas and chimpanzees. The male's large cheek pads are deposits of fat bound by connective tissue. \_\_\_\_\_
5. This primate uses booming cries to claim mates and territory. It has a rotating shoulder joint permitting arm swinging from branch to branch called brachiating. \_\_\_\_\_
6. This old world monkey's lilac colored buttocks are caused by blood filled vessels. It has patches of red and blue on its face and ridges on each side of the nasal bones. \_\_\_\_\_
7. This primate's voice, used to mark the troop's territory, can be heard two or three miles through the canopy. Males are solid black and females have olive-buff. \_\_\_\_\_
8. This great ape communicates with facial expressions and lives in troops of fifty to one hundred. It is also practices tool use by utilizing sticks and grasses to forage for termites. \_\_\_\_\_
9. This tiny monkey has a golden lion-like mane. It has a nail on its big toe instead of a claw and makes bird-like vocalization. \_\_\_\_\_
10. This ten to twelve ounce primate has a striped tail which is longer than the length of its head and body. The white rump is displayed during territorial defenses. \_\_\_\_\_

## Primate Scavenger Hunt-Answer Key

1. This primate from central Africa is black with white hair on its shoulders and tail. The babies are born with white hair. Colobus
2. This dog-faced primate's barking is particularly vocal at dawn and dusk in Madagascar. Red ruffed lemur
3. This ring-tailed species from Madagascar forms matriarchal family units of mothers, daughters and offspring. The males are subordinate to the dominant females. Ring tailed lemur
4. This long haired ape from Borneo has shorter thumbs than gorillas and chimpanzees. The male's large cheek pads are deposits of fat bound by connective tissue. Orangutan
5. This primate uses booming cries to claim mates and territory. It has a rotating shoulder joint permitting arm swinging from branch to branch called brachiating. Siamang
6. This old world monkey's lilac colored buttocks are caused by blood filled vessels. It has patches of red and blue on its face and ridges on each side of the nasal bones. Mandrill
7. This primate's voice, used to mark the troop's territory, can be heard two or three miles through the canopy. Males are solid black and females have olive-buff. Black howler monkey
8. This great ape communicates with facial expressions and lives in troops of fifty to one hundred. It is also practices tool use by utilizing sticks and grasses to forage for termites. Chimpanzee
9. This tiny monkey has a golden lion-like mane. It has a nail on its big toe instead of a claw and makes bird-like vocalization. Lion tamarin, Golden lion tamarin, Golden-headed tamarin
10. This ten to twelve ounce primate has a striped tail which is longer than the length of its head and body. The white rump is displayed during territorial defenses. Geoffroy's marmoset

Tampa's Lowry Park Zoo works together with the:

Box 488  
Wauchula, Florida 33873  
863 767 8903

## IX Primates

**Purpose:** To observe primate behavior.

**Objective:** Students will collect data to develop a behavioral ethogram for a group of primates for Tampa's Lowry Park Zoo.

**Benchmarks:** SC.F.2.4.3.b

**Materials:**

1. "Primate Behavior" worksheets
2. Stopwatch per pair of students or watch with second hand.
3. Pencil or Pen and a clipboard when you go to the Zoo.

**Pre-Visit:**

1. Go over instructions for collecting data using the "Primate Behavior" worksheet.

**Visit:**

2. Collect data and record on the "Primate Behavior" worksheet.

**Post-Visit:**

**Optional-**

3. Calculate the frequency of each behavior for each subject in the group and for the group as a whole.
4. Have the class create an ethogram for the selected primate group. Each group should collaborate before collecting data so that each group collects data on a different behavior.

**Fast fact:** The average adult male gorillas, the largest of the primates, weigh three hundred and sixty pounds. The dwarf and the mouse lemurs, all prosimians of Madagascar, have an average weight of two ounces.

*: Tampa's Lowry Park Zoo participates in ChimpanZoo. For more information go to:  
<http://www.janegoodall.org/>*



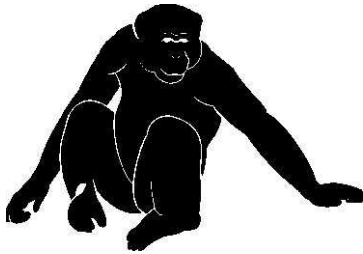
Chimpan Zoo

the Jane Goodall Institute



Research, Education and Enrichment

## Primate Behavior



Almost all primates live in some type of social group. Usually only nocturnal species, relying on hiding, will be solitary. Depending on the species, the group can range from three or four members to over fifty members.

Although feeding in groups increases intraspecific competition, being part of a large group may increase the probability that predators will be detected. By placing itself next to another, an individual also reduces its chance of becoming prey.

The types of societies formed by primates vary greatly. Gibbons are monogamous and form small groups of pairs and their offspring. Gorilla societies consist of a single breeding male with a harem and their young. Some baboons form multi-male troops while chimps form communities of unrelated females, each having an individual home range with overlap, monopolized by groups of related breeding males.

The social structure of a primate society is the consequence of the action of its individual members. Many aspects of a primate social behavior represent adaptations towards an individual's maximization of its reproductive success or of its offspring's success.

To study primate societies an ethogram needs to be created. An ethogram is a catalogue of an animal's behaviors. It is a comprehensive listing and detailed description of an animal's naturally occurring behaviors in its natural environment. It can include photographs, sketches, tables and graphs.

In this activity, you will gather data that could be used to create an ethogram. You will use the scan sampling technique to gather data about the group of primates you have selected. You should work with a partner and could work with a group, with each pair in the group collecting data on a different behavior or each pair collecting data on the same behavior but on different members if working with a large group of primates. Select an active group of primates with at least four members.

To perform your scan, proceed as follows:

A. Take a few minutes to observe the group you select, choose a behavior and define it. Examples of

primate behaviors are grooming, feeding, aggression, sexual behaviors, vocalizing, playing, and resting. Be specific and detailed in your description. Fill in the information on the chart.

- B. Select four members of the group to observe. Take a few minutes to familiarize yourself with these individuals so you can identify them.
  - a. Using the check sheet and a stopwatch or watch with a second hand, record 20 scans, using intervals of 15 seconds. Be sure you include every member in the group you have selected to observe. Place a check in the column of each individual if it is exhibiting the behavior during the 15-second scan period. Take a five-minute break to prevent observer fatigue, which can quickly lead to degeneration of the quality of data collected.
  - b. Repeat this sequence four times over a period of one half hour. That is four, five-minute record sessions, which will total up to eighty scans.





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## X Compatibility

**Purpose:** The student will be able to design a habitat and select animals which are compatible and can exist together in the habitat.

**Objective:** Understand the requirements to constructing a habitat that will allow animals to mutually co-exist.

**Benchmarks:** SC.F.1.4.7, SC.F.2.4.3, SC.G.1.4.1, SC.G.2.4.2, SC.G.2.4.5

**Materials:**

1. “Build a Habitat” worksheet included in curriculum
2. Optional-disposable or digital camera
3. Pencil or pen and a clipboard to bring to the Zoo.

**Pre-Visit:**

1. No preview activity

**Visit:**

1. Students should answer questions on the “Build a Habitat” worksheet.
2. Students should make a list of animals they might want to place in the habitats they design or take pictures of the animals if disposable or digital cameras are available.

**Post Visit:**

1. Students should design a zoo habitat with the animals that they chose and explain why they chose them. They may make a poster, a Power Point presentation, a 3-dimensional diagram, a diorama, or some other creative presentation.

**Fast Fact:** The San Diego Zoo as the first zoo to change animals in cages to open habitats that look similar to the animals’ native areas.

Name: \_\_\_\_\_

## Build a Habitat

In the wild, as well as in many animal enclosures in zoos around the world, a few animals, both big and small, can mutually co-exist together. In this activity, you will create your own zoo enclosure.

1. Does the food web play a role in what animals can be placed together in your enclosure? If so, how?

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2. Why can't all animals be placed together in enclosures as they appear in nature?

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3. In choosing your animals, there are Genetic Factors (Predator/Prey Relationship) that you will need to take into consideration. What are some of these?

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4. Fill in the Chart below. You need to fill in the Specific Factors based upon question #3 above.

Animal (Name, generic and scientific)	Why? (What is your reason for this choice?)	Factor (Use the generic factors that you came up within question #3 as a guide line for your specific factors)

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<b>BENCHMARK</b> The student:	<b>ACTIVITIES</b>
SC.F.1.4.2 knows that body structures are uniquely designed and adapted for their function.	Bird Adaptations, Make an Animal, Scavenger Hunts
SC.F.1.4.7 knows that organisms respond to internal and external stimuli.	Build a Habitat(Compatibility)
SC.F.2.4.3 understands the mechanisms of change that lead to adaptations in a species and their ability to survive naturally in changing conditions and to increase species diversity.	Build a Habitat(Compatibility), Primates, Endangered Species, Make an Animal
SC.G.1.4.1 knows of the great diversity and interdependence of living things.	Build a Habitat(Compatibility), Exotic vs. Native, Biomes & Ecosystems
SC.G.1.4.1.a diagrams a food web and describes what occurs when species are removed from the population.	Food Web
SC.G.1.4.1.b describes the negative impact of some human beings on biodiversity.	Food Web, Endangered Species
SC.G.1.4.2 understands how the flow of energy through an ecosystem made up of producers, consumers, and decomposers carries out the processes of life and that some energy dissipates as heat and is not recycled.	Food Web
SC.G.1.4.3 knows that chemical elements that make up the molecules of living things are combined and recombined in different ways.	Food Web
SC.G.2.4.2 knows that changes in a component of an ecosystem will have unpredictable effects on the entire system but that the components of the system tend to react in a way that will restore the ecosystem to its original condition.	Build a Habitat(Compatibility) Exotic vs. Native
SC.G.2.4.3 understands how genetic variation of offspring contributes to population control in an environment and that natural selection ensures that those who are best adapted to their surroundings survive to reproduce.	Endangered Species, Exotic vs. Native, Scavenger Hunts
SC.G.2.4.4 knows that the world ecosystems are shaped by physical factors that limit their productivity.	Biomes and Ecosystems
SC.G.2.4.5 understands that the amount of life any environment can support is limited and that human activities can change the flow of energy and reduce the fertility of the Earth.	Build a Habitat(Compatibility)
SC.G.2.4.6 knows the ways in which humans today are placing their environmental support systems at risk.	Exotic vs. Native, Food Web

