

Indian River Lagoon Wildlife Study Guide

Updated December 2023

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Section 1. Ecological Concepts

Wildlife Study Guide Introduction

This packet starts with ecology lessons and finishes with accounts of individual species or groups of animals. It is our hope that students will study the ecology lessons first to learn:

- why ecosystems are important to people;
- the importance of quality habitat to wildlife diversity; and
- how we use our knowledge of ecological patterns to design conservation plans

An important part of conservation planning is to account for people, and try to design plans considering human pressures on ecosystems.

After studying the ecology lessons, students should read the species accounts and think of each species in an ecological context. For example, when you read about bald eagles, think about the food webs they participate in and how that contributes to their vulnerability to long-lived pesticides. When you read about panthers, think about their large territory size, the restricted areas they live in, their vulnerability to inbreeding depression, and you will see why they are so endangered (and why all large carnivores are a conservation challenge). When you read about gopher tortoises, or alligators, notice the role they play in ecosystem function for many other animals you'll know why we call them "keystone" species and see examples of how ecosystems are linked together. Neotropical migrant birds fly between North and South America. You can begin to realize how landscapes are linked by this migration and you will get an idea of how difficult it is for us to figure out just what their worst problems are. Once problems are identified, how can we address such large-scale problems? Over all, think of each animal and the roles it may play in ecosystem services.

You will notice that many of the issues in the other Envirothon packets relate to wildlife. Forestry is important to wildlife. Soils are critical in creating plant communities that support wildlife. Water is vital to all living things. Perhaps most of all, the Indian River Lagoon section pulls together all these sections. The Lagoon, like all ecosystems, is affected by all the things around and within it. A final study note, you should understand all the terms in the glossary.

Ecosystem Services (Or, we never miss things until they are gone)

The May 15, 1997 edition of the journal *Nature* had an article that estimated the value of ecosystem services in the world. The authors estimated that the 'goods delivered to humans, by earth's ecosystems, had a value of about 33 trillion dollars per year. That estimate dwarfs the estimated human produced gross economic product of 18 trillion dollars. The implication is that if we damage our ecosystems too much, this 33 trillion-dollar service will not



Pollination by a bumblebee, a type of ecosystem service

be there for us to use, and we will be poorer in many ways. Go to:
http://en.wikipedia.org/wiki/Ecosystem_services.

The moral of this story is that humans live off ecosystem services. If we destroy the ability of ecosystems to perform these functions, we will destroy ourselves. We should not be alarmed--it is within our abilities to protect ecosystem services, but that protection will not happen unless planned. The Envirothon is all about ecosystem services. This section is about the role of wildlife in ecosystem services.

As you read this section, and all sections of the Envirothon packet, you should keep ecosystem services in mind and relate each topic to the role they play in ecosystems.

Conservation of Biodiversity--the building blocks of ecosystems

One way to help conserve ecosystem services is to conserve biodiversity--the total of all species, subspecies, and gene pools. **Conservation biology** is the scientific study of the nature and status of [Earth's biodiversity](#) with the aim of protecting [species](#), their [habitats](#), and [ecosystems](#) from excessive rates of [extinction](#) and the erosion of biotic interactions. It is an interdisciplinary subject drawing on sciences, economics, and the practice of [natural resource management](#) (http://en.wikipedia.org/wiki/Conservation_biology).

Populations of plant and animal species separated into smaller and shrinking ecosystems, offering fewer or limited ecosystem services, have high extinction rates. This idea is often called *Island or Insular Biogeography Theory* because it was first described from oceanic islands--smaller islands had fewer species (http://en.wikipedia.org/wiki/Insular_biogeography). These islands often become *biodiversity hotspots*, biogeographic region with a significant reservoir of biodiversity that is threatened with destruction (http://en.wikipedia.org/wiki/Biodiversity_hotspot).

So, what else can we do? One successful strategy in Florida is establishing **wildlife corridors**: If we can have a corridor of suitable habitat connecting our naturally intact lands, parks and reserves, species can travel and replenish areas where local extinctions have occurred, keep gene flow going, and ultimately, make our other reserves functionally larger. Corridors do not need to be pristine--just good enough for safe travel--which makes private land important. Corridors work for some species (e.g., large carnivores) but not all (e.g., species with low dispersal abilities) (county highways are corridors for city people to travel). Small reserves often can serve as "corridors" between larger reserves. "Buffer areas" are like corridors in that they border our core reserves and often only need to be semi-natural to help. For example, land around bat caves needs to have healthy bug populations so we might try to prevent heavy pesticide use in the buffer zone.

The Office of Greenways & Trails is continuing its efforts to establish a statewide system of greenways and trails for recreational and conservation purposes. Florida's vision for the statewide system will help conserve wildlife and protect Florida's native

biological diversity. The system also offers multi-use trails the length and breadth of the state, promoting appreciation of the state's natural and working landscapes, providing routes for alternative transportation and protecting cultural and historical sites). Go to the website and travel on a Greenway Corridor (see Florida Department of Environmental Protection Office of Greenways & Trails program, <https://floridadep.gov/parks/oqt>).

Look again at the list of **ecosystem 'services.'** These are all ecosystem 'processes. When we manage or protect ecosystems we try to insure these processes operate effectively. As you read those services, consider which, if lost, we could restore easily [we can restore drained wetlands fairly easily, which helps with flood abatement], and which are difficult, if not impossible to restore [we cannot restore biodiversity once lost].

Go to: https://en.wikipedia.org/wiki/Natural_resource and examine the topics on how living things interact and what are "limited natural resources" and how would we conserve them?

WHAT DO YOU KNOW ABOUT FLORIDA ECOSYSTEMS AND SPECIES???

Florida Wildlife Habitats, Florida fish and Wildlife Conservation Commission.

<http://myfwc.com/wildlifehabitats/>

Species Profiles

Click on the link above and learn about Florida's amazing assortment of birds, mammals, reptiles, fish, and more. Focus on Raptors, Owls, Songbirds (Florida Grasshopper Sparrow and Scrub-Jay), Manatee, Panther, Black Bear, Alligators, Crocodiles, Gopher Tortoise, Snakes, and Gopher Frog.

Imperiled Species

View rules and regulations along with other information on species currently listed as Endangered, Threatened, or Species of Special Concern by the FWC. There are 57 state-listed species included in the new [Imperiled Species Management Plan](#), can you name some of them?

Nonnative Species

Read about Florida's nonnative and invasive species, and learn how you can help prevent their introduction. Focus on Burmese Python, Hogs, and Lionfish.

Invasive Plants

Read about what is being done to manage Florida's nonnative and invasive plants, and learn how you can help prevent their introduction.

Wildlife Assistance/Nuisance Wildlife

Learn what do you do if you find an "orphaned" wildlife and how to deal with nuisance wildlife.

Living with Wildlife

Florida's wildlife and human population are encountering each other more often than ever before. Learn how both can live in harmony.

Prescribed Fire

Learn how prescribed fire is a safe and important wildlife management tool.

Habitat Information

Read and learn about the highly productive natural habitats of Florida, and the programs the FWC is using to help protect and maintain them. Focus on the Freshwater Ecosystems chapter of [Florida's State Wildlife Action Plan](#).

SCIENCE APPLICATION: Wildlife, Ecosystem Services, Rangeland Management and The Kissimmee-Okeechobee-Everglades (K-O-E) Watershed



A stretch of the straightened and channelized Kissimmee River in central Florida

Key Concept: *The floodplain, or watershed of the river supports a diverse community of waterfowl, wading birds, fish, and other wildlife, extending from the headwaters of the Kissimmee River to the Florida Everglades and Florida Bay.*

REVIEW <https://www.sfwmd.gov/our-work/kissimmee-river>

The Kissimmee River once meandered for 103 miles through central Florida. Its floodplain, reaching up to 3 miles wide, was inundated for long periods by heavy seasonal rains. Native wetland plants, wading birds and fish thrived there, but prolonged flooding in 1947 prompted a public outcry for federal assistance to reduce flood damage to property. In 1948, the U.S. Congress authorized the U.S. Army Corps of Engineers to construct the Central and South Florida Project, which led to engineering changes to

deepen, straighten and widen the waterway.

In the 1960s, the Kissimmee River was channelized by cutting and dredging a 30-foot-deep straightaway through the river's meanders: the C-38 canal. Before channelization was complete, biologists suspected the project would have devastating ecological consequences. While the project delivered on the promise of flood protection, it also destroyed much of a floodplain-dependent ecosystem that nurtured threatened and endangered species, as well as hundreds of other native fish and wetland-dependent animals. More than 90 percent of the waterfowl that once graced the wetlands disappeared and the number of bald eagle nesting territories decreased by 70 percent. After the waterway was transformed into a straight, deep canal, it became oxygen-depleted and the fish community it supported changed dramatically.

ACTIVITY: Explore the website, define terms "floodplain" and "watershed" and examine the issues regarding changes in the connectivity and ecosystem services that the Kissimmee-Okeechobee-Everglades naturally provides. What were the effects downstream (in the St. Lucie/Indian River Lagoon and Caloosahatchee River) from the changes to the Kissimmee River?

How are the KOE ranchland owners contributing towards the sustainable habitat preservation of this region for maintaining ecosystem biodiversity while at the same time farming and raising cattle and other livestock?

List the programs the farmers and ranchers may be participating in and explain what they do. And how they help to sustain wildlife habitats and human livelihoods at the same time?

HINT: Go to the website for the [Florida Land Steward](#) and [FWC's Landowner Assistance](#) to discover how ranchers are contributing towards sustainable wildlife biodiversity.

Section 2 Rare and Endangered Species

U.S. Fish & Wildlife Service - Endangered Species Act (ESA) Basics

Introduction - Over 25 years of protecting endangered species

When the Endangered Species Act (ESA) was passed in 1973, it represented America's concern about the decline of many wildlife species around the world. It is regarded as one of the most comprehensive wildlife conservation laws in the world. The purpose of the ESA is to conserve "the ecosystems upon which endangered and threatened species depend" and to conserve and recover listed species. Under the law, species may be listed as either "endangered" or "threatened". Endangered means a species is in danger of extinction throughout all or a significant portion of its range. Threatened means a species is likely to become endangered within the foreseeable future. All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened.

The list covers mammals, birds, reptiles, amphibians, fishes, snails, clams/mussels, crustaceans, insects, arachnids, and plants. Groups with the most listed species are (in order) plants, mammals, birds, fishes, reptiles, and clams/mussels. The law is administered by the Interior Department's U.S. Fish and Wildlife Service (FWS) and the Commerce Department's National Marine Fisheries Service. The FWS has primary responsibility for terrestrial and freshwater organisms, while the National Marine Fisheries Service's responsibilities are mainly for marine species such as salmon and whales.

Compliance with Other Laws - Florida Fish and Wildlife Conservation Commission

The Endangered Species Act is not the only law to protect species of wild mammals, birds, reptiles, amphibians and fishes, clams, snails, insects, spiders, crustaceans, and plants.

There are many other laws with enforcement provisions to protect declining populations of rare species and their habitat, such as the Marine Mammal Protection Act, the Migratory Bird Treaty Act, and the Anadromous Fish Conservation Act. The Lacey Act makes it a federal crime for any person to import, export, transport, sell, receive, acquire, possess, or purchase any fish, wildlife, or plant taken, possessed transported or sold in violation of any Federal, State, foreign or Indian tribal law, treaty, or regulation.

SCIENCE APPLICATION: Florida's Imperiled Species

Florida recently updated its imperiled species listings and developed an Imperiled Species Management Plan which was approved in November of 2016. Review the list, plan, and species profile pages at the link below to discover which species are protected, what threats they are facing, and what recovery actions can be taken to preserve them.

Review this webpage and links included within it to answer questions below:

<http://myfwc.com/wildlifehabitats/imperiled/>

- Which species in Florida are listed by both the Federal FWS and State FWC?
- Which species are only listed by the State FWC?
- What keystone species in Florida are listed species?
- How does loss of these keystone species affect the survival of other species?
- Name some programs in both the government and private sectors that are available to sustain species survival in our state? How successful are they?

Section 3 Aliens in Florida! The non-native species invasion!

Did you know aliens are among us, and many are powerfully forcing their way into our native habitats, displacing "locals"? The Florida Fish and Wildlife Conservation Commission's Nonnative Species website, <http://www.myfwc.com/wildlifehabitats/nonnatives/>, seeks to provide information and minimize the impacts non-native species have on Florida's native fish, wildlife, and marine life.

SCIENCE APPLICATION: Florida's Non-native Species

Review the above website and the following website at

<http://www.eddmaps.org/florida/species/> to learn more how non-native wildlife species in our state, where they are located, and what kinds of Florida programs are working overtime towards minimizing the impacts nonnative species have on local native fish, wildlife and marine life.

Science concept activity: After researching the above weblinks, respond to the following inquiry:

- What is a non-native species? How does it get here?
- What type of species are causing problems in our State?
- How do non-native species affect the native species; why can't native species compete with them?
- What can I do to help?
 - What are the rules and regulations that govern bringing in non-natives, and how are they implemented?
- Do you have a non-native pet, and how are you managing it?
 - Identify one alien mammal, amphibian, reptile, bird and fish species. Explain how they are impacting other species. What program is in place to control them?
 - How do humans factor into the "alien" species concept? What do you know about the "python epidemic in the Everglades"??



Did you know that there also non-native plant species changing native habitats? Review the following websites:

<http://www.floridainvasives.org/> and <http://myfwc.com/wildlifehabitats/invasive-plants/>

Respond to these questions:

- Can you list non-native plant species in our area? How are they affecting native habitats and ecosystem services? Hint: how about Brazilian pepper? Melaleuca? any others?
- What can I do at home to protect our native plant communities? Hint: Are you familiar with this program? check it out: <http://www.floridayards.org/>

Section 4 - Florida's Wildlife

Mammals

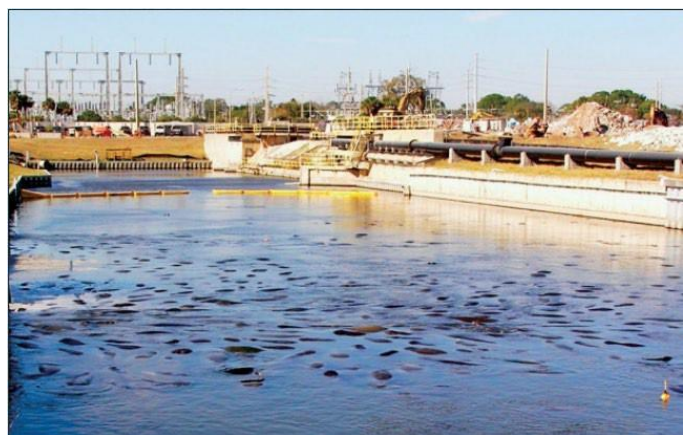
Florida Manatee (*Trichechus manatus latirostris*)

The Florida manatee is one of two subspecies of the West Indian manatee (*Trichechus manatus*), which is listed under the ESA. The other subspecies is the Antillean manatee (*Trichechus manatus manatus*) that occurs in the Caribbean and South America (see range map). The two subspecies appear similar and can only be distinguished through skeletal measurements or genetic analysis.



Both subspecies of manatee live in a variety of habitats, but their general habitat requirements include forage material (seagrass and other aquatic vegetation), freshwater for drinking, shelter for resting and calving), travel corridors, and warm water. Florida manatees occur at the northern limit of the species' range and though they are endothermic, are cold intolerant and require warm water refuges with nearby forage material during the winter. Most manatees on the Atlantic Coast, especially in the Indian River Lagoon, depend on artificial sources of warm water, such as power plant discharges to survive through the winter.

A large number of manatee mortalities have occurred in the Indian River Lagoon in the winters of 2020-2021 and 2021-



Manatees gather at a warm-water outfall at Cape Canaveral Energy Center.

2022 causing an unusual mortality event (UME) to be declared. Researchers attributed this UME to starvation due to the lack of seagrasses in the Indian River Lagoon, especially near warm water sources. In recent years, poor water quality in the Lagoon led to harmful algal blooms and widespread seagrass loss.

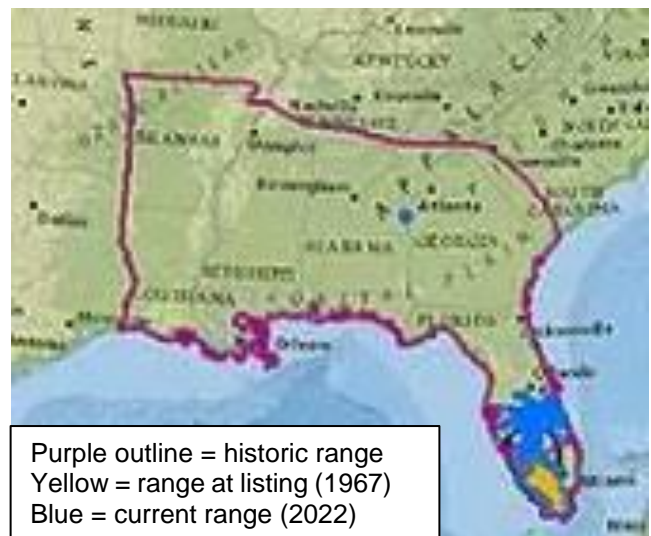
Another threat to Florida manatees is the future phase out of coastal power plants and their warm water discharges due to shifts to renewable energy in the state. Without these sources of warm water in the winter, manatees will have to find other sources of warm water or new sources will need to be created. The FWC and FWS are researching ways to enhance existing or create new thermal basins in coastal waters that take advantage of natural or created haloclines, or that could retain heat from solar radiation. For more information, visit: <https://myfwc.com/research/manatee/> and <https://www.fws.gov/species/manatee-trichechus-manatus>

Florida Panther (*Puma (=Felis) concolor coryi*)

The Florida panther is the most spectacular and most endangered of Florida's large mammals. The Florida panther is a subspecies of cougar, which formerly ranged throughout most of the U.S. but is now only found in mountainous western states and Florida. The panther is a large, powerfully built cat with a long heavy tail. The upper parts of the body are tawny colored while the underparts are dull white. The head is broad and the ears small and rounded. The sides of the muzzle are black as well as the top part of the tail. Kittens exhibit black spots until they are about 9-12 months. The male panther can weigh between about 110-160 pounds while the female will weigh between 70-100 pounds.



When the Florida panther was listed under the ESA, only about 20 were thought to remain in the wild and they were limited to southwest Florida. After a breeding program with the Texas cougar, the population began increasing to an estimated 120-230 today and their range has started expanding back to the north, though most females are still found south of Lake Okeechobee. Loss of habitat remains one of the biggest threats, along with vehicle strikes and disease.



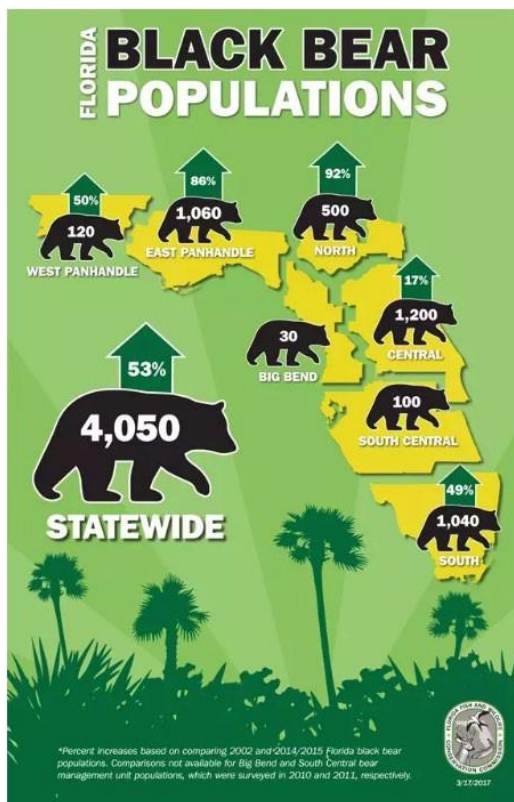
To examine the life history of the panther, its habits and habitats, and threats and programs to protect the panther population, go to:

<http://myfwc.com/wildlifehabitats/profiles/mammals/land/florida-panther/>

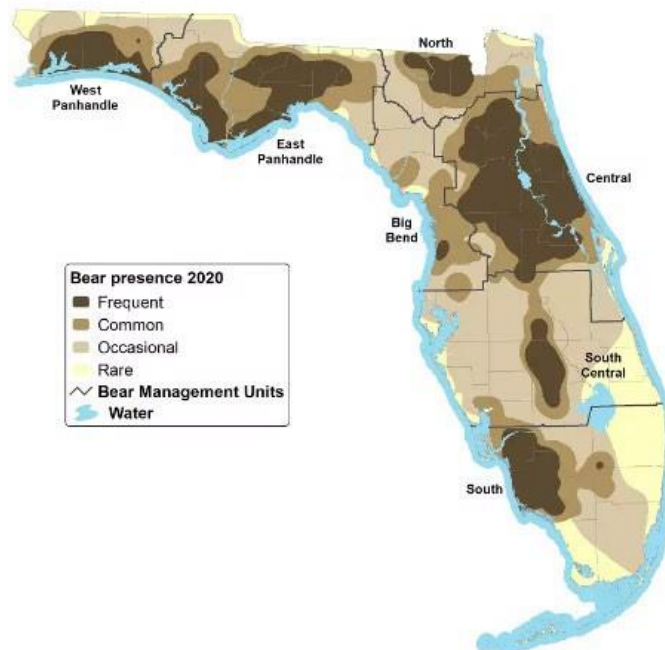
Florida Black Bear (*Ursus americanus floridanus*)



The Florida black bear is a subspecies of the American black bear. The Florida black bear is the only bear species found in Florida and is the state's largest land mammal. It is smaller than its relatives in other states, averaging only 250-450 pounds and their only coloration is black with a tan muzzle, and occasional white patches on their chest. Due to hunting, habitat loss, and road kills, Florida black bear numbers dropped to the low hundreds in the 1970s. However, due to a variety of conservation efforts, their numbers have increased to over 4,000 individuals as of 2015.



What is a BMU?



Check out <http://www.myfwc.com/wildlifehabitats/managed/bear/> and read about the topics regarding the black bear environmental problems and issues, and the programs being implemented in Florida to resolve them. How likely are you to see a black bear in your back yard? Which Bear Management Unit (BMU) is closest to your home?

Reptiles and Amphibians

Gopher Tortoise (*Gopherus polyphemus*)

The gopher tortoise is considered a "keystone" species because so many other species depend on it for their survival. The burrow of the gopher tortoise is used by dozens of vertebrate animals and hundreds of invertebrates. These species are called commensal species, which means they get benefit from the gopher tortoise but apparently give nothing in return. Some of these animals use the burrows occasionally to escape predators, adverse weather conditions, or fire and include things like skunks, opossums, rabbits, quail, sparrows, armadillos, burrowing owls, snakes, lizards, snakes, frogs, toads, and many invertebrates.



Some animals depend on the burrows for their survival. Animals that use the burrows for year-round shelter include the indigo snake, gopher frog, and Florida mouse. A recent study used very small cameras to investigate the gopher burrows and found the gopher frog was the most common commensal in the burrows. Check out

<http://myfwc.com/wildlifehabitats/managed/gopher-tortoise/> to learn more about this species.

Florida's Snakes

Florida is home to 45 native species of snakes (only 6 of them are venomous). These are found in every conceivable habitat, including coastal mangroves and salt marshes, to freshwater wetlands and dry uplands, and many species thrive in residential areas.

Snakes are strictly carnivorous, which means they must find, subdue and eat other animals to survive. Snakes cause few problems and are beneficial in reducing populations of rodents and other pests, which can damage agricultural crops. However snakes have encountered problems with human beings. In one year, from July 1990 to June 1991, 20,180 individuals of 32 species were reported collected from the wild in Florida and sold in the pet trade. Another 3,000 snakes were killed for their skins. The species most often taken for their skins were eastern diamondback (2,561) and timber rattlesnakes (265).



[Eastern indigo snake](#) *Drymarchon couperi*
(Federally Endangered)



[Florida or Eastern pinesnake](#) *Pituophis melanoleucus mugitus* (State Threatened)



[Red ratsnake or corn snake](#) *Pantherophis guttatus*
(Not Listed)



[Florida kingsnake](#) *Lampropeltis floridana* (Not Listed)

These are only the legally reported cases so the numbers are an underestimation. It is unknown how many snakes are killed “just because they are snakes”. Snakes are reptiles like lizards, turtles and crocodilians. They are covered with hard, dry scales. Their complex set of ribs, muscles, and broad belly scales propel them. Many snakes are specialists, preferring specific foods or habitats. They also exhibit various defenses when confronted. About half of Florida's snakes give birth to live young while the other half lay eggs. Here we introduce several snakes coming from two broad categories: venomous and non-venomous (the venom is poisonous but the snakes aren't-you can eat them).

<http://myfwc.com/conservation/you- conserve/wildlife/snakes/>

<https://www.floridamuseum.ufl.edu/florida-snake-id/>

American Alligator (*Alligator mississippiensis*)

The ancestors of the alligator roamed the earth 150 million years ago with the dinosaurs, and the modern species have remained virtually unchanged for 65 million years. The alligator is a very large reptile that is closely related to the American

Crocodile. The crocodile is an endangered species restricted to coastal areas while the alligator is listed as a threatened species and chiefly uses fresh water. The maximum length recorded for the alligator was 19 feet, but today an animal only half of that size is considered large.

The highest populations of alligators in the U.S. are in Florida and Louisiana, however many are found in other southeastern states. The highest populations in Florida are in the central and southern part of the state. Alligators can use saltwater but cannot spend much time there because they lack the salt-extracting glands that crocodiles have. Alligators often build dens in lake-banks or in heavily vegetated marshes. The area around the den is usually deepened into a pond referred to as a "gator hole". In times of drought these holes serve as a water source and foraging area for other species such as wading birds and even cattle. In turn, the alligators may forage on some of the visitors to the hole. Alligators are often called keystone species because of their holes.
<http://www.myfwc.com/wildlifehabitats/managed/alligator/>

American Crocodile (*Crocodylus acutus*)

American crocodiles are a shy and reclusive species. They live in coastal areas throughout the Caribbean, and occur at the northern end of their range in south Florida. They live in brackish or saltwater areas, and can be found in ponds, coves, and creeks in mangrove swamps. They are occasionally being encountered inland in freshwater areas of the SE Florida coast as a result of the extensive canal system.



It can be difficult for some to tell the difference between alligators and crocodiles. In this photo, the alligator is on top and the crocodile is on the bottom. Review the major differences here:

<http://myfwc.com/wildlifehabitats/profiles/reptiles-and-amphibians/reptiles/american-crocodiles/>

Frogs and Toads

Frogs and toads are amphibians that have very thin, permeable skin. This skin helps them regulate their body temperature, water balance, and to breathe. However this skin also makes them susceptible to accumulating pollution in their bodies from water sources. Their skin is also vulnerable to ultraviolet radiation due to loss of atmospheric

ozone. Scientists think that this increased ultraviolet radiation could also damage their eggs. The eggs are gelatinous, translucent, lack the protection of a shell, and are often laid at the surface of the water.

Amphibians must rely on their environment and their movements to regulate their body temperature. Amphibians are most active at temperatures of 40-83 degrees Fahrenheit, which in summer is most commonly at night. When temperatures become too low, amphibians become inactive at the bottom of a body of water, or underground in wet areas. When the temperature becomes too warm, they become inactive and retreat to cooler damp places.

Florida has the richest concentrations of amphibians in the United States. In many ecosystems of Florida, frogs and toads, (or salamanders in some forests) make up the greatest biomass of vertebrates. That is, if you weighed all of the frogs and toads per acre, they would outweigh the mammals, birds, snakes, lizards, turtles, or any of the other vertebrates. Frogs and toads are solely carnivorous, preying mostly on insects. Frogs and toads also are prey to many animals including birds, reptiles, and small mammals. When you consider frogs and toads can be the abundant predator, and a very abundant prey for higher level carnivores, you can appreciate how important frogs and toads can be in ecosystem functioning.

Birds

Bald Eagle (*Haliaeetus leucocephalus*)

Bald Eagles are the sole representative of the genus *Haliaeetus* ("sea eagle") regularly found in the Western Hemisphere. The southern subspecies of the Bald Eagle is a bit smaller than the northern subspecies. The Southern Bald Eagle is the largest raptor that breeds in Florida, with a length of close to a meter and a wingspan of nearly two meters. Their white head and tail, brown wings and body easily identifies adults. Young eagles are mostly brown until about 4-5 years old.



Proximity to water is a critical habitat characteristic for the Southern Bald Eagle. This is because the main source of food for the eagle is fish. They also eat birds, smaller mammals, and carrion. Nesting habitat generally requires trees with an unimpeded view of the surrounding area. Due to the fact that water edges are also a favorite habitat for

humans, there has been a great loss of Southern Bald Eagle habitats to urban and recreational development in Florida.

<http://myfwc.com/wildlifehabitats/profiles/birds/raptors-and-vultures/bald-eagle/>

Florida Scrub Jay (*Aphelocoma coerulescens*)



The Florida Scrub Jay is the only bird species completely restricted to Florida. These Jays became isolated from their western cousins thousands of years ago, and since then have developed enough different characteristics to achieve full species status. The Florida Scrub Jay exists in scrubby habitats of central Florida with the largest populations existing in the Ocala National Forest, Merritt Island National Wildlife Refuge plus adjacent areas, and in scattered patches along the Lake Wales Ridge in Polk and Highlands County. The Florida

Scrub Jay is an intelligent and bold bird that quickly learns to accept handouts of peanuts or other foods. Why is the Florida Scrub Jay called a “keystone species”?

<http://myfwc.com/wildlifehabitats/profiles/birds/songbirds/florida-scrub-jay/>

Audubon's Crested Caracara (*Caracara cheriway* or *Polyborus plancus audubonii*)

Crested Caracara is a resident of the prairies and range lands of south-central Florida. A member of the falcon family, the caracara is a strong flier but spends a lot of time on the ground, scratching or digging for insects, or hunting around shallow ponds or marshes for turtles, snakes, frogs or fish. Caracaras occasionally eat larger animals such as rabbits and cattle egrets and a pair will sometimes work together to subdue these larger prey. Caracaras may also be spotted on fence posts or utility poles along highways where they scan roadways for roadkilled raccoons, opossums or armadillos. At one time, caracaras were common in the prairies of central Florida, but their numbers declined as favored habitat was converted to housing developments, citrus groves and improved pastures. Today, both the Florida Fish and Wildlife Conservation Commission and the U.S. Fish and Wildlife Service list the caracara as Threatened.



Florida's Owls

There are five common species of owl that live in Florida, the great horned owl, barn owl, screech owl, burrowing owl, and barred owl. Most owls are nocturnal and nest in trees, caves, barns, tree cavities, and sometimes large nest boxes. Burrowing owls are unique in that they live in open treeless areas and nest in burrows similar to a gopher tortoise (sometimes even using old gopher tortoise burrows). They are also active during the day and night. The barn owl is the least common in Florida out of the five and is very different in appearance, with its large, white, heart-shaped face.



[Florida Burrowing Owl](#) *Athene cunicularia*
(State Threatened)



[Barn Owl](#) *Tyto alba*

Florida's Mottled Duck (*Anas fulvigula*)



Florida mottled ducks are commonly seen using small prairie wetlands, flood plain marshes of the St. Johns and Kissimmee rivers, and coastal impoundments. Rapid changes in the landscape of south Florida, attributed mostly to agricultural and urban development, raise concerns about the status of these wetland habitats and the wildlife that depend on them. Moreover, the continued existence of the Florida mottled duck is threatened by feral mallards, with which mottled ducks are interbreeding. Florida mottled ducks have an intrinsic aesthetic value and are highly prized as a gamebird. They also are a defining member of the unique suite of species characteristic of the prairie ecosystem of south Florida.

It will take an effort by not only the Fish and Wildlife Conservation Commission, but the

people of Florida, to ensure the continued existence of the Florida mottled duck.

The Waterfowl Management Program (WMP) of the Florida Fish and Wildlife Conservation Commission (FWC) devotes considerable resources to monitoring and managing Florida's residents and migrant birds, and providing quality habitat.

Review <http://myfwc.com/wildlifehabitats/profiles/birds/waterfowl/> to learn about Florida's waterfowl and the state's management program.

Fish

Fish are wildlife, but often overlooked in relation to their significance in ecosystem function, in our culture, and in our economy. Commercial and recreational fishing is extremely important to Florida. Fish also are an integral part of many of Florida's ecosystems and provide many benefits to human beings.

Fish are cold-blooded vertebrates that live in water, breathe with gills, and have fins rather than legs. Cold-blooded means their surrounding environment largely regulates their body temperature. There are 3 classes of fishes, the jawless fishes (lampreys and hagfishes), the cartilaginous fishes (sharks, skates, rays, and related fishes), and the bony fishes, which comprise 97% of the species. Fish are the most diverse vertebrate class with about 20,000 described species worldwide. There are three million acres of freshwater lakes and 12,000 miles of rivers and streams in Florida. From these water bodies, more than 250 species of fish have been collected. Of those, 73 were non-native species. Saltwater species are more numerous.

See the following websites to learn more about Florida's freshwater and saltwater fishes: <http://myfwc.com/wildlifehabitats/profiles/freshwater/>
<http://myfwc.com/wildlifehabitats/profiles/saltwater/>

Some fish migrate, often between marine and freshwater environments. The [Atlantic sturgeon](#) in Florida is an example of a fish that will migrate from a marine environment to a freshwater environment to spawn. Other species live in freshwater but go to marine environments to spawn, such as the [American eel](#).

Fishes feed on every trophic level. The carnivores eat flesh, some fish filter feed, which means they strain plankton or other small organisms with their gills. Others are bottom feeders who use their mouths to suck up organic material from the bottom. Others are "cleaners" that eat debris and parasites from scales of larger fish. The mosquito fish is an important insectivore in Florida because it feeds on mosquito larvae and provides an effective control on these insects.

Fish are good indicators of ecosystem health and water quality. Some commercially important fish, such as bass and sunfish, are killed by nutrient enrichment. Altering flow patterns of rivers affects fish, as demonstrated when the channelization of the Kissimmee River caused the decline of desirable fish such as [bass](#) and [sunfish](#), and an

increase in unpopular species such as [gar](#) and [bowfin](#).

Pollutants such as heavy metals, pesticides and fertilizers not only can directly kill fish, but some can be passed up food chains, even affecting terrestrial animals. Many lakes, stretches of rivers, and other bodies of water have such unsafe pollution levels, especially mercury, that the fish have been declared unsafe to eat by health agencies. As you can predict, predator fish have more bioaccumulation of mercury than other fish. Siltation is also a problem. Siltation intensifies when we disturb soils for agriculture, forestry, housing developments, roads, or other human activities.

Another problem Florida's fish face is the introduction of exotic species that out compete the native populations. Introduction of an exotic fish species, such as Tilapia and [Lionfish](#), out-compete native fish for food in the Indian River Lagoon. Also, introduced species have caused population declines of the [Okaloosa Darter](#) in freshwater. The opossum pipefish in the Indian River lagoon is in trouble because, among other reasons, herbicides are used in its breeding areas. The [shoal bass](#) has been greatly depleted due to siltation and the building of dams on the Chatahoochee River. The freshwater habitats of the bigmouth sleeper along southeast Florida coasts have experienced major declines in water quality due to increased human development. Lake Apopka, Florida's fourth largest lake, has lost its bass populations due to nutrient loading, a massive chemical spill, and other problems.

Fish with lesions were recently found in the St. Lucie estuary perhaps as a result massive freshwater flows into the estuary.



Florida's Most Wanted Invasive Fish
Lionfish

<http://www.reef.org/lionfish>

It is important to protect fish populations. The state depends heavily on the revenue generated by commercial and recreational fishing. The health of our ecosystems is reflected through fish populations.

SCIENCE APPLICATION: WILDLIFE IN FLORIDA, WHAT'S AT STAKE?



You have reviewed many facets of wildlife and how they are integral in the overall ecosystem services and landscape ecology of our state, Florida. Now, as a wrap up, consider the future of wildlife in Florida.

Go to website <http://www.myfwc.com/conservation/special-initiatives/wildlife-2060/> and review the following links provided:

- [What's at stake?](#)
- [Habitat loss](#)
- [Habitat isolation](#)
- [Coastal challenges](#)
- [Water quality & quantity](#)
- [Wildlife/Human interactions](#)
- [Access to land & water](#)
- [Landowner Assistance](#)

Discuss with your classmates the environmental problems our wildlife is coping with for survival. What issues require resolution by Floridians in order to maintain balance in their uses of ecosystem services and the landscape, in order to sustain Florida's wildlife? Without sustainable programs, how would Floridians themselves fare in the future?

Wildlife and Ecology Glossary

Adaptation – the long-term process of evolutionary change by a species.

Bioaccumulation – the additive accumulation of substances in the tissues of organisms in food chains (e.g. accumulation of mercury in fish, then in raccoons that eat many fish, then in panthers that eat many raccoons).

Biodiversity - the variety of life. It is seen in the number of species in an ecosystem or on the entire Earth.

Biomass – the total mass of all biological organisms.

Buffer – a region of transition around a valuable habitat (e.g. a semi-natural area between a preserve and an urban area).

Carnivore – an animal or plant that eats animals.

Carrion – a dead body or dead decaying flesh.

Carrying capacity – the maximum number of species a given area of habitat will support at any given time (e.g. deer populations can exceed carrying capacity if not kept in check by natural predators or humans; when they exceed the carrying capacity the available food will be summed and there will be a large die-off of deer).

Commensal – a term to describe a species that lives in close association and gets some benefit from another species but does not return any benefit (e.g. gopher frogs live in gopher tortoise burrows but provide no benefit for the gopher tortoise).

Conservation easement – the development rights on a piece of property which will restrict the activity on that piece of property (e.g. owning a conservation easement on a ranch that says the ranch cannot be developed for citrus or subdivisions, but can continue ranching. We often use conservation easements to maintain a status quo on land).

DDT – one of a family of organo-chloridine pesticides that was banned in the United States because of environmental concerns, particularly associated with bioaccumulation leading to egg-shell thinning and egg breakage in birds such as the Bald Eagle, Brown Pelican and Peregrine Falcon.

Domesticated – a plant or animal that has been selectively bred by humans to enhance certain characteristics. Domesticated organisms are called 'breeds' or 'varieties' and are roughly equivalent to human-created subspecies. Wild animals simply raised in captivity are not domesticated.

Ecosystem – a community of organisms and their physical environment interacting as a unit.

Ecosystem services - processes by which the natural environment produces resources useful to people, as to economic services. They include provision of clean water and air, flood control, pollination of crops, mitigation of environmental hazards, pest and disease control, carbon sequestration, and aesthetic, cultural and ethical values associated with biodiversity.

Ecozone – the largest scale of biogeographic division of the earth's surface

Ectothermic – organisms that depend mainly on external heat sources, and their body temperature changes with the temperature of the environment.

Endangered – species in danger of extinction or extirpation if the harmful factors affecting their populations continue to operate (compare with lesser risk categories of

threatened or species of special concern).

Endangered Species Act of 1973 – a federal law that protects species that are endangered or threatened from disturbance, and also mandates recovery plans for these species.

Endemic – restricted to a particular region or locality; unique and native.

Endothermic – organisms that use internally generated heat to maintain body temperature.

Estuary – a semi-enclosed water body that has free connection to the open seas and within which seawater is measurably diluted with freshwater.

Exotic – an organism that is not native in the area where it occurs; introduced.

Extirpate – elimination of a species from a given area; local extinction.

Feral – domesticated animals that have gone wild (e.g. hogs, dogs, cats).

Food chain – a sequence of feeding types, on successive levels within a community through which energy and biomass is transferred (e.g. plants are eaten by rodents that are eaten by snakes that are eaten by hawks).

Food web – the network of interconnected food chains of a community (in the food chain example, plants are eaten by many herbivores, who are eaten by many carnivores).

Forage – vegetation taken naturally by herbivorous animals(n); the act of searching for and eating vegetative materials(v).

Gene pool – the total genetic information that a population has; the sum of all genes.

Habitat succession – the natural progression of habitat types over time (e.g. the first community to replace a deforested area is a weedy grassland, then it grows to a shrub community, and eventually back to a forest). Different ecosystem types have different successional paths and endpoints depending on soils, climate, topography, ongoing disturbance, fire frequency and other factors.

Herbivore – an animal that feeds on plants or plant material.

Hibernation – the act of passing all or part of winter in a dormant state where body functions is greatly slowed.

Hydrologic cycle – the natural movement of water through the environment, including rain, runoff, and evapotranspiration.

Hydroperiod – the duration and timing that water is present in an area (e.g. different wetlands have standing water for different periods of time and the plants and animals present are adapted to this amount of time).

Inbreeding depression – caused by repeated mating of successive generations of closely related individuals. This occurs especially in small or isolated populations and becomes problematic when deleterious genes (e.g. birth defects) are present—they spread quickly through the remaining population and are a great extinction threat (e.g. the Florida Panther).

Invertebrate – animal lacking a spine or backbone.

Island biogeography theory – the theory that says smaller areas will have fewer species (e.g. a small park in the middle of an urban landscape is like an island and will lose more species over time than a larger park).

Keystone species – a species that other species depend upon for survival (e.g. gopher tortoise, alligator).

Landscape – large areas of connected ecosystems. (i.e. wetlands, forests, agricultural

areas, and water bodies are all part of the landscape).

Migration – the movement of animals to and from feeding or reproductive and nesting areas.

Mimicry – the close external resemblance of an animal or plant (or part of one) to another animal, plant, or inanimate object.

Molt – to shed hair, feathers, shell, horns or an outer layer periodically.

Mortality – death rate.

Nutrient loading – the addition of nutrients from human activity to a water body, especially phosphorous and nitrogen.

Omnivore – an animal that feeds on both plants and animals.

Parasitic – a relationship in which one organism is dependent upon another living organism (the host) and which is typically detrimental to the host.

Prescribe burn – fires that are set by humans to restore a natural fire cycle to ecosystems.

Range – the geographic area or areas normally inhabited by a species.

Rare – species that are uncommon, and usually potentially at risk because of their restricted geographic area or habitat.

Ruminant – an even-toed hoofed mammal with a stomach of four chambers that swallows its food un-chewed, then regurgitates it, chews it thoroughly, and re-swallows it. Common ruminants are the camel, giraffe, deer, pronghorn, and cattle. Bacteria in the gut digest the cellulose in the food.

Scrub – a type of habitat dominated by woody vegetation composed principally of shrubs or shrub-like trees and having deep, very well drained, sandy soils.

Species of Special Concern – species that are considered vulnerable to large-scale population declines. This category is not as severe as endangered or threatened.

Taxonomy – the arrangement of plants and animals into groups based on their natural relationships. Standard classifications are into 7 groups listed below, but are subdivided for different taxa.

Kingdom – the two dominant kingdoms are plant and animal.

Phylum – vertebrates and invertebrates are the most recognized phyla.

Class – vertebrate classes include birds, mammals, fish, amphibians, and reptiles, there are multitudes of invertebrate classes, and fish often are broken into many classes).

Family – examples of families in the order carnivore include Canidae (dogs, wolves) Felidae (cats), Mustelidae (weasels, skunks, badger), and others.

Genus – the genus of dogs is *Canis* (genus names are always capitalized and either underlined or italicized).

Species – closely related individuals which actually or potentially interbreed, the domestic dog species is *familiaris*, the coyote is *latrans*, and the wolf is *rufus*, all in the genus *Canis*. Species names are underlined or italicized, but NOT capitalized.

Territory – the concept of dominance over a unit of habitat; an area defended by an animal against others of the same species, or sometimes other species; can be defended for breeding, feeding, courtship, or other reasons.

Threatened – a designation given to species that are likely to become endangered in the foreseeable future if current trends continue. This is the intermediate category between endangered and species of special concern.

Toxin – any of various poisonous substances produced by certain plant or animal cells.

Ultraviolet radiation – radiation from the sun that is normally blocked by the ozone layer in the atmosphere. This radiation is composed of photons in the “ultraviolet wavelength” and can be damaging to humans and animals.

Upland – elevated, well drained areas.

Vertebrates – an animal that has a backbone.

Wetland – land periodically flooded by water or where water is a dominant factor affecting the characteristics of soil; and supporting distinct plant and animal communities. The concept that wetlands are land that is often inundated separates them from lakes that are continuously inundated.

Wildlife Corridor – a term to describe pathways used by wildlife to travel between preserves or other valuable habitat areas.

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