

## USGS and the Everglades Ecosystems

The Everglades ecosystems contain diverse environments that stretch from the middle of the Florida peninsula to Florida Bay. The unique resources and conditions the Everglades provide helped to shape the course of history and development in South Florida and remain a key component of the physical and economic landscape. In addition to its importance to Florida, the Everglades ecosystems have been designated by the United Nations as a World Heritage Site and an International Biosphere Reserve.



The Everglades is composed of diverse ecosystems and vegetation, such as mangroves pictured above.

The United States Geological Survey (USGS) has many ongoing research projects that are expanding scientific knowledge of the unique ecosystems and their inhabitants. The work being done by USGS scientists is providing sound scientific data to facilitate efforts to restore the Everglades to its original functions.

The Everglades is composed of diverse ecosystems including estuaries, pinelands, hardwood hammocks, prairies and cypress systems. These areas provide unique conditions for a vast array of plant and animal communities.

### Florida Bay

Florida Bay is the 850 square mile estuary where fresh water flowing from the Everglades meets with the salt water of the ocean. With an average depth of four to five feet, the cloudy, brackish water of Florida Bay is home to many species of gamefish such as bonefish, tarpon, snook and seatrout. Seagrasses and mangroves provide shelter to



Manatee mother and calf

many marine species as they develop. According to the National Park Service, this “nursery” supports a \$300 million sport fishery and a \$100

million commercial fishery adjacent to the Park. In addition, Florida Bay is home to marine mammals such as Atlantic bottlenose dolphins and West Indian manatees, as well as reptiles, including green sea turtles and American crocodiles.

In the past few decades, the plant and animal communities of Florida Bay have undergone significant changes. Algal blooms constrict the amount of sunlight and oxygen

available to seagrasses that provide the foundation of habitats. As plans to restore the Bay to its original state are being considered, USGS scientists are studying the factors that are thought to have contributed to the degraded conditions. In order to ascertain the best methods for restoration, scientists are determining which changes are parts of the ecosystem’s natural cycle and which resulted from human activities.

### Pinelands

Flatwoods, or the pineland ecosystems of the Everglades are characterized by open, sunny conditions and their relatively high elevation. The inches that separate the pineland habitats from marshes provide a dryer setting in which slash pine flourishes. The pine has adapted a multi-layered bark that provides protection from fire. Pinelands are dependent upon fire to clear out the hammock species that crowd the ecosystem and produce too much shade with their dense canopies. The USGS has ongoing research studying fire in the pineland ecosystems including determining the effect of repeated fires at different seasons and frequencies. The data will be useful to fire management programs in



Fire burning in the Everglades

determining the most effective use of prescribed fires to sustain the ecosystem.

## Hardwood Hammocks

Like pinelands, hammocks are higher in elevation, providing a dryer environment for plant and animal communities than the surrounding sawgrass prairies. Hammocks are crowded stands of hardwood trees such as mahogany, gumbo limbo, cocoplum, live oak, red maple and hackberry. Shaded by the dense canopy, ferns and air plants thrive inside the hammock. Unlike the pinelands, hammocks are not well adapted to survive fire. Acids from decaying plants dissolve the limestone surrounding the hammocks, creating a natural moat that protects the area from fire. Humidity and higher moisture levels in the soil also deter fires.



USGS intern obtains data about alligators by searching for their nests.

## Prairies

The prairie ecosystems of the Everglades include coastal and sawgrass prairies. Coastal prairies are situated between the tidal flats of the Florida Bay and dry land. Succulents and other salt-tolerant vegetation characterize this arid region. Sawgrass prairies are characterized by the presence of the sedge sawgrass that gets its name from the sharp saw-like teeth attached to the blade. The sawgrass grows in about two feet of water when the prairie floods each summer during the wet season. This ecosystem provides the basis for many food chains. Small creatures feed on the algae mat that grows as the water level rises. Small

## Endangered Species of the Everglades Ecosystems

Butterflies:	Schaus swallowtail
Rodents:	Key Largo wood rat Key Largo cotton mouse
Mammals:	Florida panther West Indian manatee
Birds:	snail kite Southern bald eagle Arctic peregrine falcon Cape Sable seaside sparrow wood stork
Reptiles and Amphibians:	Kemp's ridley turtle green turtle hawksbill turtle American crocodile leatherback turtle

USGS scientists are currently conducting research on West Indian manatees, snail kites, Cape Sable seaside sparrows and American crocodiles.

fish and frogs feed on the small creatures and are in turn food for birds, mammals, reptiles and larger fish.

USGS scientists are conducting many research programs using the Across Trophic Level System Simulation (ATLSS), a model simulating the effects of hydrology on prairie and other Everglades ecosystems. ATLSS is being used to predict how animal populations such as American alligators, deer, wading birds and Florida panthers will react to

differing hydrologic scenarios. This information will be used to aid development of monitoring and management programs for the ecosystem.

## Cypress Systems

Cypress trees, which are closely related to the redwood and sequoia, thrive in the wet conditions of the Everglades. The seeds grow in muddy areas, and the trees can survive in standing water. Cypress will grow on sawgrass prairies as well as cypress domes. These sites have a slightly lower elevation and are usually roughly circular. During the wet summer season, the water may be

three feet deep. The dome is created by the larger trees, which grow in the center where the soil is deeper and perhaps richer. Smaller trees grow on the perimeter of the dome. Air plants, ferns, orchids and Spanish moss grow on the cypress trees.

## Further Research

USGS scientists are conducting many research projects that will aid understanding of the diverse ecosystems of the Everglades. They are studying the effects of environmental contaminants on invertebrates and other components of the Everglades food chains. These efforts will enable the assessment, detection, and potential prevention of adverse effects of contaminants on wildlife in the South Florida ecosystems.

USGS scientists are also studying population structures and genetic markers as a way to assess the degree of movement and mixing in these populations. These techniques will help determine if populations of invasive species, such as Asian swamp eels, have the same sources of origin or if new populations of the species have been introduced into the environment.



USGS scientists are conducting research that will aid efforts to keep nonindigenous animals, such as the Asian swamp eel above, from entering the Everglades.

For more information on these and other research projects being conducted by the USGS regarding the Everglades visit <http://sofia.usgs.gov> or [www.fcsc.usgs.gov](http://www.fcsc.usgs.gov) or call (352) 378-8181