LESSON 4 - COASTAL ECOSYSTEMS:
Beach, Estuary, Marsh, and Swamp

BACKGROUND BASICS.

Coastal areas exist at the interface of land areas and large bodies of water. Florida has many miles of coastal areas due to the fact that it is a peninsula bordered by the Atlantic Ocean on the east, the Gulf of Mexico on the west and Florida Bay to the south. In addition to these areas, Florida also has an abundance of bays and estuaries associated with the state's river systems that add many miles to the coastline. These coastal and estuarine ecosystems are extremely productive areas for sea life. These areas are also one of the main features that attract millions of people to Florida.

Of all Florida's natural areas, the coastal ecosystems of; beach/dune/barrier islands, salt marshes, estuaries and mangrove swamps are the most threatened. Nearly 80% of the state's human population live in coastal areas. The development resulting from this population pressure has consumed large portions of these coastal ecosystems. Human activities around the remaining coastal natural areas can impact water quality, beach development, sedimentation rates biodiversity and can further threaten these fragile ecosystems.

In some areas even the salinity of the water can be altered by human activities. (**Salinity** is a term used to describe the relative amount of salts in water or in soil). Storm water runoff, sewage discharges, bridges and other structures can alter water flow and either increase or decrease salinity levels. Salinity is important because some organisms can only live within a specific range of salinity. Since saltwater and freshwater from the land are often combined in coastal areas, the varying levels of salinity may determine the types of ecosystems that can exist.

Beach/Dune/Barrier Island Ecosystems

The beach/dune/barrier island ecosystem is probably the most dynamic habitat found in Florida. These areas change constantly with the action of winds, tides and currents. The most dramatic changes occur during storms as strong winds send waves crashing into dune areas or when hurricanes push storm surges far inland. These natural actions have occurred for millennia shaping and changing the coastal ecosystems.

Recent human habitation has, in many areas, altered the cycles of sand movement, dune development and succession. Beach erosion has increased dramatically in some areas to a point where the replenishment of sand is done by dredging offshore areas or trucking sand from inland sandpits. In many instances, various physical structures are installed to prevent the erosion. Sea walls, jetties, groins and riprap are used to "stop" the natural forces at work.

To understand part of the dynamics of the beach/dune/barrier island complex, one should understand the differences between high wave energy and low wave energy areas. This can be interpreted simply by the size and the frequency of waves. Differences in wave energy will determine the amount of change in the physical environment, and its influence on the plant and animal species that can live in a coastal area.

Very few plants or animals live directly on high energy ocean beaches, but many species depend on them for survival. Arthropods, molluscs, and insects escape the pounding surf below the sand. Gulls, sandpipers and other shorebirds are common predators that probe the sand for food.

One of Florida's most highly valued food fish, the pompano, also lives in this environment, feeding on sand fleas and mole shrimp that have burrowed into the sand at the shore line. Huge schools of baitfish including menhaden, cigar minnows, and Spanish sardines attract predators such as cobia, crevalle jack, Spanish mackerel and other prized gamefish.

Florida's east coast is considered a high wave energy system. Prevailing wind action on the Atlantic Ocean has many hundreds of miles to build swells. These swells increase as they approach shallow inshore areas and finally break, forming waves of significant height (3-12 ft.) depending on the power of the offshore wind.

The force of high energy waves can move tremendous amounts of sand and bottom material from the beach to offshore sites. When sufficient materials are deposited in these areas barrier islands can develop. Sometimes the opposite occurs and sand is deposited at the beach front, where wind can move it inland to form sand dunes. In either case the beach is the all important buffer zone, absorbing the energy of waves that might otherwise erode dunes and other coastal formations.

The west coast of Florida is much different. The height and frequency of waves along most of this coast are much smaller when compared to the Atlantic side. The smaller surface area of the Gulf of Mexico, combined with varying winds and bottom features produces less energy for wave formation. Fewer and much smaller beach areas exist in the Big Bend area of the Gulf coast due to the lower

wave energy. Those that due exist are many times part of a barrier island that also helps protect inshore marshes and land areas.

Salt Marshes

The gentle incline of the Gulf Coast reduces wave force and allows marsh grasses to establish themselves in shallow water areas. Salt marshes are communities of nonwoody, salt tolerant plants. The largest amount of salt marsh in Florida occurs from Tampa to Pensacola, with the greatest development in the Big Bend area. A smaller area of salt marsh occurs along the Indian River Lagoon and in the vicinity north of Jacksonville, Florida.

Salt marshes are composed of a variety of different species, depending on location, including; grasses, sedges, and rushes. This vegetation plays a critical role in shoreline stabilization, trapping sediments and eventually "building" land in the process. Marshes provide critical wildlife habitat and are breeding/nursery grounds for numerous fish and invertebrates. The plants are producer organisms in food chains and food webs that include insects (e.g., marsh fly, sand gnats, mosquitoes), birds (e.g., king fisher, great blue heron, hooded merganser), shellfish (e.g., fiddler crab, pink shrimp, clams), fish (croaker, Gulf menhaden, sea trout) and mammals (raccoon and otter)

Estuaries

Those water areas where saltwater and freshwater meet are known as estuaries. Estuaries such as the Indian River Lagoon, Tampa Bay and Charlotte Harbor form enormous areas along both coasts of Florida. The west coast of Florida alone has approximately 2.5 million acres of estuarine habitat that include open water, salt marshes and mangrove swamps.

Estuaries are intricately interwoven with surrounding ecosystems through geological, biological, chemical, and ecological processes. The inflow of freshwater from springs and rivers, nutrients from upland areas, organic matter from salt marshes, tidal influences, and sediment loads from the land and offshore sources can all contribute to the health or demise of the fragile estuarine ecosystem.

Two important factors related to the biological characteristics of estuary ecosystems are the diversity of habitats and the high productivity of the associated food webs. The variety of habitats including sandy bottom, sea grass beds, oyster bars, and mud flats provide living areas for over two thirds of Florida's commercially important fish and shellfish. The high nutrient levels in

estuarine waters provide a rich "soup" that nourish plants and animals making estuaries one of the most productive ecosystems on earth.

Many fish, including redfish and mullet, spawn in offshore locations where the eggs develop into larvae that are carried into estuaries by tides and currents. Huge numbers of microscopic algae, diatoms and other types of phytoplankton are estuarine producers that juvenile fish depend on for food. Larger plants such as turtle grass, manatee grass, and shoal grass provide food and cover for other consumers (e.g., crabs, scallops, shrimp, and small fish). Second order and third order consumers (e.g., great blue heron, seatrout, redfish, and coastal shark species) also roam these fertile areas in search of smaller prey.

Although estuaries are not sites of human development in the same ways as the beach/dune/barrier islands, they still receive a great deal of human use. This use takes on many forms including: recreational boat traffic, shrimping, docking and loading areas, a place

for municipal discharge and sites for mariculture. These uses have impact beyond the estuaries waters' both ecologically and in relationship to human values. Humans are influenced economically, aesthetically and culturally by this resource. With proper management and effective planning Florida's estuaries can remain a viable and important part of our future.

Mangrove Swamps

The mangrove swamp ecosystem exists in the southern part of the state from Cape Canaveral on the east coast to Tampa Bay on the west side. This limitation in distribution is a result of sensitivity too freezing temperatures. Although, mangroves have been reported sporadically north to the Mississippi Delta, only in relatively frost free areas do the true mangrove forests develop.

Mangroves can attain heights of 80 feet hence the name mangrove forests. In many areas hurricanes will destroy mangroves before the plants have an opportunity to reach these heights. In the process though, mangroves buffer the storm and provide protection to inland areas.

These bands of coastal mangroves also function as critical nursery areas for many species of fish and shellfish. The prop roots of the red mangrove give protection to shrimp, blue crab, and snook. Mangroves also provide areas for oysters to grow. Mangrove leaves that drop to the water form a detritus dependent food web that nourish these species and many more. The mangroves also help trap sediments from upland areas, filter estuarine waters of nutrients and can remove some pollutants from the water column.

CONCLUSION

The total area that Florida's coastal ecosystems cover is quite small when compared to the entire land mass of Florida. By some estimates, approximately 3% of Florida's land area consists of barrier islands, mangrove swamps and salt marshes. This should give you an idea of the limited area coastal ecosystems occupy, and the fragile nature of these areas. It's also easy to see that with 80% of the human population on or near these important coastal ecosystems the potential impact upon them is tremendous.

By using the following activities in Lesson 4 individuals can gain a better understanding of these important ecosystems. From this understanding, an awareness hopefully will develop that leads individuals to act in appropriate ways to help protect and preserve this most important piece of Florida, our coastal ecosystems.