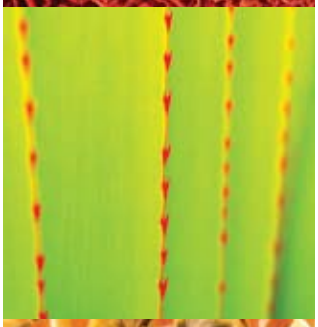
ECOREGION: GULF COAST



As the Mississippi River flows south, the land becomes flatter and warmer until eventually the river spills out into the Gulf of Mexico. The Mississippi is the largest of many rivers and streams that flow through the marshy lands of the Gulf Coast ecoregion to meet the ocean. This coastal ecoregion stretches in an arc from the tip of Florida to the tip of Texas, passing through the southern areas of Louisiana, Alabama, and Mississippi on the way.[1] In these coastal flatlands, temperate and tropical climates as well as salt and fresh waters combine to create an ecoregion of astonishing beauty and productivity.

To the east, the Gulf Coast ecoregion begins with the swampy western coast of Florida, including the Everglades in the southern tip of the state. In the Everglades, shallow sheets of water flow slowly towards the ocean, creating freshwater sloughs, or low-lying areas of land that channel water.[2] Mangroves grow up and down Florida's coast and can survive in the salty coastal waters. The long roots of these trees provide feeding and nesting places for shrimp and fish. Further west, the Mississippi River empties into the ocean, creating an **estuary** where salt water from the Gulf of Mexico mixes with fresh Mississippi water. The vast acres of wetlands here are home to many commercially important species, such as oysters and blue crabs.[3] On the western side of the Gulf Coast ecoregion, the longest barrier island in the world, Padre Island, lies along the coast of Southern Texas and forms the Laguna Madre lagoon. Padre Island's uninhabited beaches are one of the most important nesting places for sea turtles, including the endangered Kemp's Ridley sea turtle.[4]

Although the Gulf Coast ecoregion is one of North America's most diverse and productive, frequent hurricanes on the coast, fires in the dry upland areas, and the pounding ocean surf ensure that these ecosystems are constantly responding to the demanding climate.

IMPACTS OF CLIMATE CHANGE

Climate change will impact the Gulf Coast ecoregion in ways which may fundamentally change how many ecosystems in the area function. Climate models predict that winters are likely to become 3-5°F (1.7-2.8 °C) warmer, while summers may become up to 3-7°F (1.7-2.8 °C) hotter.[5] At the same time, lowland coastal areas are expected to receive less rainfall on average and to experience more frequent intense rainfall events followed by longer drought periods.[6] The coastal areas of this ecoregion are exceptionally flat, which means that sea levels are likely to rise by a dramatic amount – 13 inches by 2100![7] Climate change may also cause hurricanes to become more intense.

The combination of drought and sea level rise will create stressful conditions for coastal trees that are not adapted to high levels of salinity in the ground water. In fact, scientists studying Waccasassa Bay in Florida found that salt marshes have recently begun to replace coastal forests in the area. The scientists believe that the decline of coastal forests is due to the fact that the trees cannot survive with so much salt in the water.[8] The combination of sea level rise and warmer weather is likely to stress other coastal species, and may prompt migrations. For example, tropical plants that are adapted for warm weather conditions may migrate north, while temperate species may migrate out of the Gulf region. For example, black mangroves are already beginning to move north with the frost line into parts of Louisiana.[9] As climate change occurs, climate models predict that the wetlands of this ecoregion will shrink drastically, putting extreme pressure on the hundreds of species that live in the wetlands. Species that are already endangered, such as the Florida panther and the Cape Sable Seaside sparrow will be put at further risk by the changes in climate.[10]

SPOTLIGHT ON A SPECIES

The red mangrove, *Rhizophora mangle*, is found in subtropical and tropical coastlines in the northern and southern hemisphere. In the Gulf Coast, it is a dominant species along the coast, particularly in brackish areas close to the water's edge. The red mangrove is easy to tell from other mangrove trees, such as the white and black mangrove, by its tall arching roots (called "prop roots") that extend into the water from high up on the stem of the plant. These roots provide air to the underwater roots and also help to stabilize the tree in the water. Other important features of the red mangrove include its pale yellow flowers, shiny leaves, and brown berries.[11,12]

Tropical storms and hurricanes, which are predicted to become more intense as warming temperatures increase, destroy many trees when mangrove forests are in their path. The destruction of trees and their roots can make the soil unstable and more susceptible to rising sea level.[13] Higher temperatures from climate change are expected to raise sea level by expanding ocean water, melting mountain glaciers and small ice caps, and causing portions of Greenland and the Antarctic ice sheets

to melt.[14] This sea level rise from climate change could make it difficult for forests to re-grow after a tropical storm or hurricane.[15]

Mangroves, like the red mangrove, are critical to their coastal ecosystems. When their leaves fall in the water, they provide important nutrients to many tiny creatures.[16] In fact, mangrove forests produce 3.6 tons of leaf litter per acre per year![17] Mangroves also provide protection for estuarine and coastal fishery food chains by serving as feeding, breeding, and nursery grounds for a variety of fish, shellfish, birds, and other wildlife. Finally, as mentioned above, they protect and stabilize low lying coastal lands.[18]

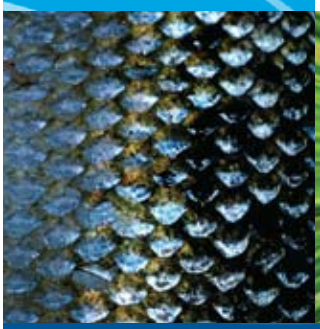
Mangroves are important to humans too, since we depend on many of the fish and bird species that live in mangrove communities. For example, the Goliath Grouper relies on the mangroves in Southwest Florida for the first 5-6 years of its life.[19] We also use timber products from mangroves for fuel and charcoal. Finally, mangrove forests serve as buffers against storm impacts along the coast. Loss of mangrove forests would harm not only animals, but people that live along the coast as well.[20]

PROFILING A CLIMATE STEWARD

Hurricanes can dramatically alter ecosystems, especially in coastal regions. In Alabama, students are helping to restore important coastal habitat by planting native vegetation. Since 2005, students have participated in the Baldwin County Grasses in Classes (BCGIC) program to help grow native plants for wetland and dune restoration projects.

Hurricanes in 2004 and 2005 caused severe damage to dune systems and salt marshes in Alabama. This damage created the need for widespread restoration of coastal habitats, particularly planting of native grasses. Without native grasses, the beaches can quickly wash away, harming water quality, tourism, the fishing industry, and wildlife habitat for animals like sea turtles and shorebirds.

BCGIC was launched to assist with restoration efforts. With guidance from teachers and experts, students maintain and monitor native plant




nurseries at their school. Students also assist local scientists with monitoring the restoration sites during the school year whenever possible. In some places, such as Bon Secour Wildlife Refuge, student volunteers plant native grass species such as bitter panic grass (*Panicum amarum*) and sea oats (*Uniola paniculata*). In other places, such as Weeks Bay Reserve, students help remove invasive species such as the common reed (*Phragmites*) and replant grasses like black needle rush (*Juncus romerianus*) and smooth cordgrass (*Spartina alterniflora*). These students not only get hands-on experience with restoration, but they also learn how to investigate and solve ecological problems!

Rising sea levels may inundate wetlands and erode beaches in areas like those in the Gulf Coast.[21] That's why it is so important to plant native vegetation to protect the beaches!

Similar Grasses in Classes Programs exist in Florida and Maryland. For more information on the Alabama program, please visit: http://www.tampabaywatch.org/index.cfm?fuseaction=content.home&pageID=30 and http://www.bcbe.org/Default.asp?PN=Pages&SubP=Level1&DivisionID=824&DepartmentID=952&SubDepartmentID=0&PageID=1470&keyword=grasses%20in%20classes.

FOR MORE INFORMATION

- The Union of Concerned Scientists' website explains how the Gulf Coast ecosystems function and the probable effects of climate change on those ecosystems. http://www.ucsusa.org/gulf/gcchallengeclimate.html
- The US Global Change Research Program includes links to several reports and workshops on the impacts that climate change will have on the Gulf Coast region. There is general information on climate change included in these reports, as well as specific information on the Gulf Coast. http://www.usgcrp.gov/usgcrp/nacc/gulfcoast.htm
- Everglades National Park's website contains information on the Everglades as well as many pictures of the plants and animals of this region. http://www.nps.gov/ever/naturescience/index.htm
- The US Environmental Protection Agency's Climate Change – Health and Environmental Effects website contains maps of the Gulf Coast which highlight areas at risk from sea level rise. http://epa.gov/climatechange/effects/coastal/slrmaps_gulf.html
- The Intergovernmental Panel on Climate Change (IPCC) is the definitive source of unbiased climate change science. www.ipcc-wg2.org/index.html

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