Earth Gauge
A National Environmental Education Foundation Program

# Gulf Oil Spill Series: Impacts on Coastal Wetland Plants

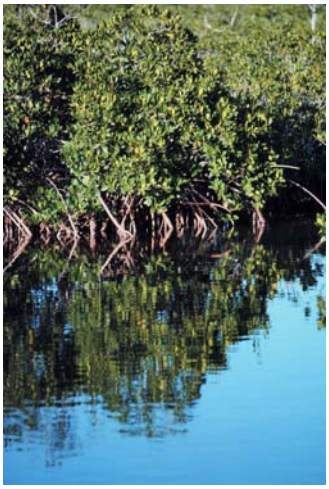
*Earth Gauge's Gulf Oil Spill series focuses on unique topics related to the Gulf of Mexico and the effects of the 2010 oil spill. All fact sheets, images and videos are freely available for use on-air and are available online at* **www.earthgauge.net/2010/gulf-oil-spill-resources**.

## WETLANDS 101

A wetland is an area of transition between a land-based and water-based ecosystem. Though there are many different types of wetlands, they have three physical characteristics in common:

- *Water* – Wetlands are saturated or covered with shallow water for at least some period during the year. However, because of tides, rainfall, snowmelt and drought, the presence of water does not necessarily indicate a wetland.
- *Hydric Soil* – Hydric soil is formed under saturated conditions, often has limited or no oxygen and may include an upper layer of decaying plant matter that decomposes slowly or not at all.
- *Hydrophytes* – Wetlands provide habitat for hydrophytes, or "water-loving" (aquatic) plants, that are adapted to living in saturated soil all or part of the year.

Because it may be difficult to distinguish if an area is a wetland, and between different types of wetlands, plant species are often used as indicators. The soil type and quality, fluctuation of water levels and flooding and climate and seasonal weather patterns in a wetland influence what plant species grow there. Learn more about wetland plants at **www.earthgauge.net/wp-content/fact_sheets/EG_Wetland%20Plants.pdf**.



*Mangrove swamp in Southeast Florida. NOAA.*

## COASTAL WETLANDS IN THE GULF OF MEXICO

Coastal wetlands include tidal and non-tidal, fresh, brackish (mixed fresh and salt water) and saline wetlands. Some key coastal wetland habitats include salt marshes, freshwater marshes, seagrass beds and mangrove swamps.

*Wetlands adjacent to Barataria Bay, south of New Orleans. Photo courtesy of Dr. Terry McTigue, NOAA.*

More than half of coastal wetlands in the lower 48 United States are found along the Gulf of Mexico coast and 40 percent are found in Louisiana alone. These wetlands provide vital habitat for fish, shellfish, birds and other wildlife. By weight, 97 percent of commercial fish and shellfish caught in the Gulf of Mexico depend on wetlands at some point in their life cycle. In Louisiana, fish and shellfish catch along the coast accounts for about one-third of all fish harvested in the lower 48 States.

Coastal wetlands also protect water quality, stabilize shorelines, prevent erosion and buffer our coastal areas from storms. For every three miles of coastal wetlands, which can include marshes, floodplains and a variety of other wet habitats, storm surge can be reduced by about one foot.

**IMPACTS OF OIL ON COASTAL WETLANDS**

Most research on the impacts of oil in wetlands has taken place in saltwater marshes; little is known about the impacts of oil on freshwater marsh plants. Impacts vary depending on factors such as the type of oil spilled, the level of plant exposure and the type of cleanup activities taking place. Below are some impacts of oil on coastal wetlands that have been observed through lab experiments and observation during and after oil spills.

**Impacts on individual plants**

- *Stomata*, tiny pores primarily found on the undersides of plant leaves, let carbon dioxide in and oxygen out. Plants use carbon dioxide to make food through photosynthesis. When oil coats plant leaves, it can block stomata, reducing the plant's ability to make food. If many leaves are coated in oil, the plant may die. In less extreme cases, the plant may begin to recover with new growth after just a few weeks.

- Stomata also allow water vapor to escape from leaves, a process called *transpiration*, which cools the plant much like sweating cools a human. Blocked stomata can cause a plant's temperature to increase, damaging or killing leaves and impacting internal plant processes.

- Whether or not a plant survives exposure to oil depends on what parts of it are damaged. If oil floating on the water's surface comes in contact with stems and leaves, the exposed parts become coated with oil and may die. In this case, the roots may remain alive and stems and leaves may regenerate the following year. If oil penetrates the soil and the roots die, air stored in the roots is released, causing the soil to sink.

**Impacts on plant communities**

- Wetland plant species have varying sensitivities to oil. Tolerant plants are more likely to survive, which can change the makeup of a plant community. For example, observation of various cordgrass species (*Spartina*) in a brackish marsh after a crude oil spill in South Louisiana showed that some species recovered from exposure to oil more readily than others. Smooth cordgrass (*Spartina alterniflora,* shown in the photo at right) displayed the best recovery and also the greatest increase in ground cover after the spill, suggesting that this species was more tolerant to oil than other cordgrass species in the same area.


- Some oil cleanup activities may damage plant communities. Skimming, cutting vegetation and flushing wetland areas with clean water can cause soil erosion and permanent loss of wetland plants. Wetland areas that have been burned after an oil spill can take years to recover. The makeup and distribution of plant species in these wetlands may change significantly post-burn.

**Oil in wetland soils**

- Both oxygen and nutrients are required for microbes within soil to *biodegrade*, or break down, oil. While soils in Gulf Coast marshes are hypoxic or anoxic (having little or no oxygen, respectively), they do not lack nutrients. Biodegradation occurs at a much slower rate than in open water.

- When an entire plant community dies from oil exposure, there are no longer roots to hold the soil in place. Soils erode, collapse or sink, leading to higher water levels and excess flooding that may prevent plants from growing back.

**Timing of the spill**

- Studies have shown that plants sustained more damage when exposed to oil in spring, during the growing season, than they did in fall, at the end of the growing season.

- Plants are more active during the growing season, meaning that damage is likely to be more obvious. For example, oiled flowers may not produce viable seeds. Seeds that are coated in oil may not germinate and grow.

- If plants leaves and stems are exposed to oil only once, regrowth typically occur. If they are exposed repeatedly, the plant is more likely to die.

**Sources:**

U.S. EPA, Office of Wetlands, Oceans and Watersheds. *Celebrate Coastal Wetlands…Connecting Us All!* Available from **water.epa.gov/type/wetlands/outreach/upload/coastal_final.pdf**.

NOAA Oil Spill Response. *Shorelines and Coastal Habitats in the Gulf of Mexico.* Available from **response.restoration.noaa.gov/book_shelf/1889_Shorelines-fact-sheet.pdf**.

Pezeshki, S.R., Hester, M.W., Lin, Q. & J.A. Nyman. "The effects of oil spill and clean-up on dominant US Gulf Coast marsh macrophytes: a review." *Environmental Pollution 108 (2000): 129-139.*

The Deepwater Horizon disaster and wetlands. Statement from the Environmental Concerns Committee of the Society of Wetland Scientists. Available from **www.sws.org/docs/SWS_OilEffectsOnWetlands.pdf**.

The Wetland Foundation. Oil Spill Impacts on Coastal Wetlands of the Mississippi River Delta. Video available at **http://www.youtube.com/watch?v=syGM13egoc0**.