

3 Gulf of Mexico

Overview

The Gulf of Mexico lies south of the continental United States, east of Mexico, and northwest of Cuba. It is bounded by five U.S. states (Florida, Alabama, Mississippi, Louisiana, Texas), six Mexican states (Tamaulipas, Veracruz, Tabasco, Campeche, Yucatan), and Cuba.

The Gulf measures approximately 1,600 km from east to west and 900 km from north to south.

< <http://www.edc.uri.edu/lme/text/gulf-of-mexico.htm> >

Location



Basic information

Surface area : 1,535,015 km²

Volume : 2,434 km³

Average depth : 1,615 m

Maximum depth : 4,384 m

Nature

< Background >

Water enters the Gulf of Mexico through the Yucatan Channel of Mexico and exits through the Straits of Florida. Additionally, two-thirds of the river water from the U.S. and half the river water from Mexico drain into the Gulf.

Climate

The Gulf coast area of the U.S. has a mild climate with an average annual temperature of 20 °C. The average temperature in January is 5 °C and the average temperature in July is 28 °C. The average annual precipitation is 1,700 mm. In Mexico, the Gulf coast is mainly in the *tierras calientes* (hot lands) that are the low coastal plains rising to an altitude of about 915 m. This region is very humid and the temperatures vary between 16 and 49 °C. During summer and autumn the whole area in the Gulf of Mexico is prone to hurricanes.

Topography

The Gulf's shoreline is fringed by numerous bays and small inlets. The land that forms the Gulf's coast, including many long, narrow barrier islands, is almost uniformly low-lying and is characterized by marshes and swamps, as well as stretches of sandy beach.

About one third of the area of the Gulf of Mexico lies on a continental shelf. The Gulf is topographically diverse with smooth slopes, escarpments, knolls, basins and submarine canyons.

The Gulf of Mexico basin resembles a large pit with a broad shallow rim. Approximately 38 per cent of Gulf waters are shallow intertidal areas. The waters of the continental shelf (<200 m deep) and continental slope (200-3,000 m deep) represent 22 and 20 per cent of the Gulf's waters respectively, and abyssal areas deeper than 3,000 m comprise the final 20 per cent. Located in the southwestern quadrant, the Sigsbee Deep is the deepest region of the Gulf of Mexico, reaching a depth of 4,384 m.

< <http://www.edc.uri.edu/lme/text/gulf-of-mexico.htm> >

< <http://www.gulfbase.org/facts.php> >

Hydrology

The broad, shallow shelf waters are strongly wind-driven out to depths of approximately 50 to 60 m.

A prominent feature in the Gulf of Mexico is the Loop Current, which enters through the Yucatan Channel and exits through the Straits of Florida to become the Florida Current and, later, the Gulf Stream. Large unstable rings of water are shed off from the Loop Current, bringing massive amounts of heat, salt and water across the Gulf. Thus, the Loop Current plays an important role in shelf-nutrient balance.

Drainage into the Gulf of Mexico is extensive and includes 20 major river systems (>150 rivers) covering over 3.8 million km² of the continental United States. Annual freshwater inflow to the Gulf is approximately 10.6 x 10¹¹ m³ per year. Eighty five per cent of this flow comes from the United States, with 64 per cent originating from the Mississippi River alone. Additional freshwater inputs originate from Mexico, the Yucatan Peninsula and Cuba.

< <http://www.edc.uri.edu/lme/text/gulf-of-mexico.htm> >

< <http://www.gulfbase.org/facts.php> >

< Surrounding environment >

The Gulf of Mexico estuaries provide critical feeding, spawning and nursery grounds for a rich assemblage of fish, wildlife and plant species. Hundreds of species of birds, recreational and commercial fish and shellfish species, native cypress and mangroves, and threatened and endangered species such as sea turtles, Gulf sturgeon, beach mice and manatees can be found in the Gulf estuary. Also, these estuaries support submerged aquatic vegetation communities that stabilize shorelines against erosion, reduce non-point source loadings, improve water clarity and provide habitat.

Wildlife

Coral reefs are found in a discontinuous arc around the Gulf, with the greatest development along the Florida Keys and Cuba.

The Gulf of Mexico contains some of the most spectacular wildlife in the world, including manatee, bottlenose dolphins, migrating whooping cranes, American crocodiles and alligators, roseate spoonbills, sea turtles and whale sharks, to name a few.

- < <http://epa.gov/owow/oceans/nccr/downloads.html> >
- < <http://www.edc.uri.edu/lme/text/gulf-of-mexico.htm> >
- < <http://www.gasp-seakayak.org/wild.html> >

Marine Protected Areas

- The Florida Keys National Marine Sanctuary (U.S.)

The most extensive living coral reef in the United States is adjacent to the 203 km island chain of the Florida Keys. The Keys are located on the southern tip of the Florida peninsula, beginning just south of Key Biscayne and ending just 145 km north of Cuba. These coral reefs are intimately linked to a marine ecosystem that supports one of the most unique and diverse assemblages of plants and animals in North America. The 9,600 km² Florida Keys National Marine Sanctuary (FKNMS) surrounds the entire archipelago of the Florida Keys and includes the productive waters of Florida Bay, the Gulf of Mexico and the Atlantic Ocean. Cultural resources are also contained within the sanctuary. The proximity of coral reefs to centuries-old shipping routes has resulted in a high concentration of shipwrecks and an abundance of artifacts.

- Flower Garden Banks National Marine Sanctuary (U.S.)

Located about 169 km directly south of the Texas/Louisiana border, Flower Garden Banks National Marine Sanctuary holds the northernmost coral reefs in the United States. Twenty one species of coral, 80 species of algae, more than 250 microinvertebrate species and loggerhead turtles reside in the 144 km² sanctuary.

There are also nationally designated parks and protected areas in Mexico, such as Parque Nacional Sistema Arrecifal Veracruzano, Parque Nacional Arrecife Alacranes and Area de Protecci de Flora y Fauna Yum Balam.

- < <http://floridakeys.noaa.gov/> >
- < <http://www.flowergarden.nos.noaa.gov/> >

History and Culture

It is thought that the Gulf of Mexico formed approximately 300 million years ago.

The Gulf’s coastal areas were first settled by American Indian groups, including those representing various advanced cultures of Mexico. Since then, the Gulf region has settled by African slaves, French and Spanish colonists and Native American traditions. Caribs boated from Havana to Tampa, and Mexican mound-builders are believed to have brought religion up the Mississippi. During the period of European exploration and colonization, the entire region became a theatre of contention between the Spanish, French and English. The present-day culture of the coastal region is primarily Spanish-American (Mexico, Cuba) and Anglo-American (U.S.).

- < <http://www.gulfbase.org/facts.php> >

Social Environment

< **Population** >

The total population of the Gulf’s coastal region is approximately 63 million, which is comprised from 46.7 million (in 1999) in the five Gulf coast states in the U.S., 13.9 million (in 2000) in the six coastal states in Mexico, and 2.28 million (in 2003) in coastal cities in Cuba. The population along the Gulf coast is concentrated around Houston, New Orleans and Tampa Bay. In Florida and Louisiana, substantially more than 50 per cent of its population resides in coastal counties.

< Land use >

About 58 per cent of the Mississippi River basin is cropland. Other significant land uses (and their percentages) of the basin include woodland (18%), range and barren land (21%), wetlands (2.4%) and urban land (0.6%). Runoff from these diverse land-uses discharges into streams and reservoirs, eventually flows into the Mississippi River and ultimately discharges into the Gulf of Mexico.

Range land is the predominant land use in the Rio Grande basin, another major contributor to the inflow into the Gulf, constituting about 77 per cent of the basin. Land used for other agriculture, such as irrigation and pasturing, is 5.8 per cent, and for forest is 2.7 per cent of the total land use in Rio Grande basin.

Land use in Cuba is comprised of arable land (24%), permanent crops (7%), permanent pastures (27%), forests and woodlands (24%) and others (18%).

< <http://www.noaa.gov/> >

< Industry >

The Gulf's waters are utilized by many upland, waterfront, and offshore activities, including tourism, recreational fishing, seafood production, boating, marinas, shipping, petroleum production and urban use.

Fisheries

Commercial fishing is an important component of the Gulf's economic value. The seafood processing and wholesale sector is a major employer in the Gulf region. These industries provide an important employment base for many coastal communities.

Gulf of Mexico fisheries include penaeid shrimp, menhaden, king and Spanish mackerel, snappers, groupers, yellowfin tuna, swordfish and sharks. These fisheries have reached their harvesting limits.

Gulf fisheries are some of the most productive in the world. In 2000, the commercial fish and shellfish harvest from the five Gulf states was estimated to be 770,000 kg which represents almost one-fifth (19.4%) of the total domestic landings in the United States. In the same year, commercial catches in the Gulf represented approximately 25 per cent of the total U.S. domestic commercial fishing revenue, and were valued at over \$900 million. The Gulf also supports a productive recreational fishery. Excluding Texas, the Gulf states accounted for over 40 per cent (>47,000 kg) of the U.S. recreational finfish harvest in 2000.

Shipping

Another major industry associated with the Gulf is shipping, with major shipping lanes in the Gulf and the Intracoastal Waterway. The products and port facilities contribute to important sources of employment. The volume and value of shipping has increased in the Gulf region, with the volume of imports and exports increasing from 292 million tons in 1986 to 360 million tons in 1992, and the nominal value has increased from \$73 billion to \$81.3 billion.

Petroleum Industry

It is estimated that $1.4\text{--}7.2 \times 10^8$ barrels of petroleum and $4.4\text{--}22.3 \times 10^{10}$ m³ of natural gas are present beneath the seafloor in the northern Gulf. According to the Minerals Management Service, offshore operations in the Gulf produce a quarter of the U.S. domestic natural gas and one-eighth of its oil. In addition, the offshore petroleum industry employs over 55,000 U.S. workers in the Gulf. In Mexico, the Mexican petroleum industry (PEMEX) estimated that 2,540 million barrels of oil and 68.8 million m³ of natural gas were produced each day from the Gulf of Mexico's offshore operations in 2001.

< <http://www.gulfbase.org/facts.php> >

< <http://www.edc.uri.edu/lme/text/gulf-of-mexico.htm> >

Environmental Problems**< Current status >**

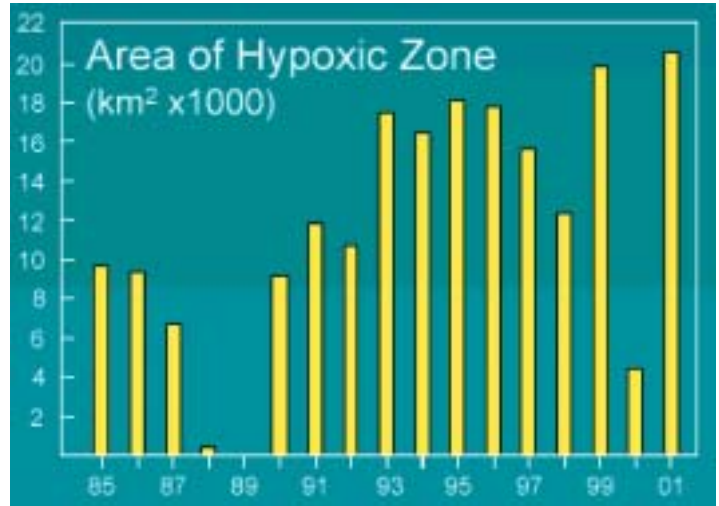
The primary problems in the Gulf Coast estuaries during the 1990s were sediment contamination, wetland

losses, poor benthic conditions and high eutrophic conditions. Over 25 per cent of sediments were enriched or exceed ERL* guidelines. Although this problem may be improving, there are environmental factors that are degenerating, such as benthic community diversity, eutrophic conditions and wetland losses.

*ERL: Effects Range Low, the concentration of a contaminant that will, based on literature studies, result in ecological effects about 10 per cent of the time.

Other Environmental Problems

The Gulf of Mexico shows signs of ecosystem stress, mostly in bays, estuaries and coastal regions, which can be directly related to toxic chemicals, physical restructuring of the coast, local harvesting of preferred species and nutrient loading from rivers. Stresses and their effects include shoreline alteration, pollutant discharge, oil and gas development, disease prevalence, exotic species introduction and nutrient loading. High productivity and stratification has resulted in hypoxic bottom waters from April to October due to the decomposition of organic matter, which creates an abiotic zone that kills fish. The seasonally severe hypoxia occurs on the inner to mid-Louisiana continental shelf west of the Mississippi and Atchafalaya rivers’ deltas. This is the largest zone of hypoxic bottom water in the western Atlantic, rivaling the Baltic and northwest Black Seas.



Area of Hypoxic Zone in Gulf of Mexico

< <http://www.csc.noaa.gov> >

< <http://www.edc.uri.edu/lme/text/gulf-of-mexico.htm> >

< <http://epa.gov/owow/oceans/nccr/downloads.html> >

< **Environmental Protection Measures** >

The Florida Department of Environmental Protection (DEP) has taken the initiative in ecosystem management. It was influenced in part by the state legislature, which in 1993 directed the DEP to protect the functions of entire ecological systems. There have been successes with point-source regulation and wetland management, but the larger issue of non-point sources and cumulative impact is yet to be solved.

The EPA’s National Estuary Program (NEP) supports six projects along the Gulf of Mexico.

The National Marine Fisheries Service (NMFS) is responsible for managing and sustaining most living marine resources and their habitats in U.S. waters.

The Southeast Regional office provides technical and administrative support to the Gulf of Mexico Fishery Management Council (Gulf Council), one of eight councils established by the Magnuson-Stevens Fishery Conservation and Management Act, as amended (Magnuson-Stevens Act).

The Gulf Council prepares fishery management plans for species in Federal waters of the Gulf of Mexico, excluding highly migratory species which are managed directly by NMFS.

< <http://www.edc.uri.edu/lme/text/gulf-of-mexico.htm> >

Monitoring program

The Environmental Monitoring and Assessment Program (EMAP) focused its coastal monitoring efforts on the Gulf of Mexico estuaries from 1991 to 1999. The Joint Gulf States Comprehensive Monitoring Program (GMP, 2000) began in 2000 in conjunction with the EPA’s Coastal 2000 Program. In addition, since the late 1980s, NOAA’s National Status and Trends (NS&T) Program has collected contaminant bioavailability and sediment toxicity data from several Gulf of Mexico locations.

< <http://epa.gov/owow/oceans/nccr/downloads.html> >

Related organizations and NGOs

- US EPA (U.S. Environmental Protection Agency) Gulf of Mexico Program
< <http://www.epa.gov/gmpo/> >
- Centro de Ecología, Pesquerías y Oceanografía del Golfo de México (EPOMEX)
< <http://www.uacam.mx/epomex/index.html> >
- Centro de Investigaciones Marinas (CIM)