

General Coral Reef Facts

Healthy coral reefs are among the most biologically diverse and economically valuable ecosystems on earth, providing valuable and vital ecosystem services.

Coral ecosystems are a source of food for millions; protect coastlines from storms and erosion; provide habitat, spawning and nursery grounds for economically important fish species; provide jobs and income to local economies from fishing, recreation, and tourism; are a source of new medicines, and are hotspots of marine biodiversity. They also are of great cultural importance in many regions around the world, particularly Polynesia

Based on current estimates, shallow water coral reefs occupy approximately 284,300 square kilometers (110,000 square miles) of the sea floor. If all of the world's shallow water coral reefs were placed side-by-side, they would occupy an area a bit larger than the state of Texas.

The total area of coral reefs represents less than 0.015 percent of the ocean. Yet coral reefs harbor more than one quarter of the ocean's biodiversity. No other ecosystem occupies such a limited area with more life forms.

Reefs are often compared to rainforests, which are the only other ecosystem that can boast anywhere near the amount of biodiversity found on a reef. Coral reefs are sometimes called rainforests of the seas.

Oil spills and coral reefs

NOAA has produced two summary documents on corals and oil spills:

a guide for planning and incident response

(http://response.restoration.noaa.gov/book_shelf/70_coral_full_report.pdf)

and a synthesis of previous research on oil effects to corals

(http://response.restoration.noaa.gov/book_shelf/1_coral_tox.pdf).

In 2005, NOAA conducted an exercise to test emergency response to a simulated oil spill in the Florida Keys (<http://sanctuaries.noaa.gov/safeseas/pdfs/safeseas2005.pdf>).

Impacts of oil spills to coral reefs are difficult to predict because each spill presents a unique set of physical, chemical, and biological conditions. How corals are exposed to oil—and the composition of the oil at the time of impact—bears directly on how serious the impact will be.

There are three primary modes of exposure for coral reefs in oil spills:

- Direct oil contact is possible when surface oil is deposited on intertidal corals that live near the surface of the water and become exposed with the tides.
- Rough seas and a light, soluble oil can combine to mix the oil into the water below the surface, where it can impact corals. Corals are exposed to less oil beneath the water surface, but the lighter oil components that mix easily are often the most toxic.

- Subsurface oiling can occur when heavy oils weather, or mix with sediment material. This increases the density of the oil to the point where it may actually sink, potentially smothering corals.

Oil Spill Response Strategies for Coral Reefs

Booms are sometimes used to control the movement of oil at the water surface. This should be done carefully in coral reef areas, as boom anchors can physically impact corals, especially when booms are moved around by waves.

Dispersants act like detergents, breaking an oil slick into droplets that mix into the water column, where they dilute and eventually biodegrade. Dispersants work best on light oils, and are less effective on oil that has been extensively weathered or in areas of low water movement. Dispersants offer a trade-off of oil effects in the water versus at the shoreline. The use of dispersants over shallow submerged reefs is generally not recommended, but the potential impacts to the reef should be weighed against impacts that might occur to birds, mammals, turtles, and sensitive shoreline resources (such as mangroves) where it is extremely difficult to clean the oil.

Effects of oil and dispersants on coral reefs

Laboratory, field studies, and actual oil spill events often appear to show contradictory results for effects of oil and dispersants on coral reefs.

The old notion that coral reefs do not suffer acute toxicity effect from oil floating over them is probably incorrect. Direct contact with spilled oil can lead to coral death, but depends on coral species, growth form, life stage, and type/duration of oil exposure.

Longer exposure to lower levels of oil may kill corals, as well as shorter exposure to higher concentrations. Death may not be immediate, but rather take place long after the exposure has ended.

Instead of acute mortality, it is more likely that oil effects occur in sublethal forms, such as reduced photosynthesis, growth, or reproduction. Early developmental forms (like coral larvae) are particularly sensitive to toxic effects, and oil slicks can significantly reduce larval development and viability.

Coral communities may recover more rapidly from oil exposure alone than from mechanical damage. Recovery of coral reefs after oil exposure, however, may depend partly on the recovery of associated communities (e.g. nursery or foraging habitats, such as mangroves and seagrasses) that may be more seriously affected than the reef itself. Recovery time depends on the type and intensity of the disturbance and can range from several years to decades.

Past Oil Spills Impacts to Coral Reef Ecosystems

One extensively studied spill occurred at Bahia Las Minas, Panama in April, 1986. An estimated 60,000-100,000 barrels of medium weight crude oil spilled into the waters of the bay, causing widespread lethal and sub-lethal effects to coral.

In contrast, in the Arabian (Persian) Gulf Spill in January 1991, the largest oil spill in history, an estimated 6.3 million barrels of oil were released. Given the magnitude of this release and the coral reef impacts noted at other tropical spills, there were dire expectations of severe impacts to reefs in Kuwait and Saudi Arabia. However, to date, the extent of coral reef damage directly attributable to the Gulf Spill has been remarkably minor.

What you can do

NOAA's comprehensive efforts in response to the Deepwater Horizon event can be found at <http://www.incidentnews.gov/incident/8220>. Because oil is a hazardous material, volunteer opportunities are limited for unaffiliated, untrained volunteers. To report oiled shorelines or request volunteer information, please call 281-366-5511 or 866-448-5816.