SPILL SCIENCE
Our Coast Three Years Later
Oil Spills and Gulf Ecology
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ALL ABOUT OIL

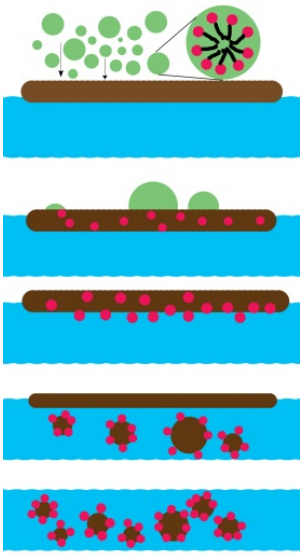
HOW OIL GETS INTO THE OCEAN

Large events like the Deepwater Horizon and Ixtoc oil spills are rare (although not rare enough), but oil has several more frequent ways of moving into the ocean. It is naturally released into the ocean by seeping through bottom sediments. Also, small spills regularly impact various parts of the Gulf of Mexico ecosystem. In Louisiana, 1500 events per year spill 330,000 gallons of oil (Louisiana Oil Spill Coordinator's Office). This fact sheet describes how three Gulf of Mexico ecosystems are affected by crude oil and some of the challenges we face in cleaning oil from these habitats.

PROPERTIES OF OIL IN THE ENVIRONMENT

Oil produced in different locations has different properties. The oil released during the Deepwater Horizon Oil Spill was Louisiana Sweet Crude Oil. Sweet oil contains little sulfur, while sour oil has high sulfur content. Sweet oil is more valuable because sulfur reduces the effective energy content of the oil and damages pipelines. Louisiana Sweet is also a light oil, which means it has lower density and flows freely at room temperature. Light oil is more valuable than heavy (denser) oil because refining it produces a higher percentage of gasoline and diesel fuel. Contact with water or air causes crude oil to weather, a process that changes its chemical composition and removes some of the most toxic components.

DISPERSANT USE



Dahlia88, 2012, creative commons.

A dispersant (shown in green in the figure) includes parts that attach to oil (a detergent, shown in pink) and parts that attach to water. Dispersants have been spread on or near the ocean's surface in past oil spills because they help break up the oil slick as shown in the figure. This increases the rate of microbial degradation and spreads some components of the oil through the depth of water. During the Deepwater Horizon Oil Spill dispersant was applied at a depth of about 1500 m (~5000 ft). Dispersants are toxic and scientists are exploring the effect of dispersants and the combination of dispersants and oil on organisms.

Aerial dispersant application, May 5, 2010. U.S. Air Force, public domain.

BARRIER ISLAND ECOSYSTEMS

Washed up, weathered oil is easier to collect on sand beaches than in water. Machines help with oil removal. Oil biodegrades rapidly when exposed to the elements on beaches. However, oil is often buried in the sand, which preserves it for future exposure.

Oil approaching beach on Chandeleur Islands, La, 2010. Stewart Long, Grass Roots Mapping, creative commons.

DEEP-WATER OCEAN ECOSYSTEMS

Dispersant use during the Deepwater Horizon spill caused some oil to be deposited in sediment below the Gulf of Mexico. This prevented the oil from washing ashore and protected beaches and coastal ecosystems, but the effects of oil and dispersants on deep water ecosystems are unknown. Scientists are studying these effects.

COASTAL/SALT MARSH ECOSYSTEMS

Oil can damage salt marshes by killing vegetation that holds sediment in place, leading to marsh loss. Efforts to clean the fragile ecosystems may cause more damage than leaving the oil would. Allowing oil to degrade on its own is an option that must be considered when marshes are oiled.

Oiled marsh in Mississippi Sound, 2010. Chris Snyder, GCRL, used by permission.

OIL SPILLS AROUND THE WORLD

1978 Amoco Cadiz
Location: Brittany, France
Released: ~67 million gallons (255 million liters)
Composition: Medium Arabian Crude (sour, light)
Reported Impact: Mousse slicks covering 125 miles of coast.

Oiled beach, 1978. NOAA (http://response.restoration.noaa.gov/index.php), public domain.

1979 Ixtoc I
Location: Bahia de Campeche, Mexico
Released: 126 million gallons (477 million liters)
Composition: Mexico-Maya Crude (very sour, light)
Corexit 9527 used
Impacts: Widespread pollution of estuaries and coastal lagoons; eliminated ghost crabs from large area.

Ixtoc I oil well fire after the platform sank, Bay of Campeche, Mexico. NOAA (http://response.restoration.noaa.gov/index.php), public domain.

1989 Exxon Valdez
Location: Prince William Sound, Alaska
Released: 11-32 million gallons (41-119 million liters)
Composition: Prudhoe Bay Crude (heavy)
Impacts: Large number of animal kills.

Cleaning beaches after tanker Valdez ran aground, 1989, public domain.

1999 Kuwait Oil Wells, Gulf War
Location: Persian Gulf, Iraq/Iran
Released: Estimated at 168-252 million gallons (637-954 million liters)
Composition: Iran Light Crude (average sulfur, density)
Claimed Impacts: 240 miles of Persian Gulf coastline "beyond repair."

Plumes of smoke from Kuwait oil well fires, 1991. NASA, public domain.

1970-2000 Niger River Delta
Location: Nigeria
Released: 7,000 major spills released estimated 2.4 million tons
Composition: Nigeria Bonny Light (very sweet, light)
Claimed Impacts: Reduced life expectancy (40-years) among residents of rural communities that use river water.

2010 BP Deepwater Horizon
Location: Northern Gulf of Mexico, United States
Released: 210 million gallons (795 million liters)
Dispersant: Corexit 9500/9527, 1.8 million gallons (6.8 million liters)
Composition: Louisiana Sweet Crude (very sweet, light),
Impacts: Data are still being collected regarding impacts to human and animal health and coastal and deep-water ecosystems. Adverse effect on seafood industry and tourism from Texas to Florida.

Fire on the Deepwater Horizon rig, 2010. U.S. Coast Guard, public domain.

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THE UNIVERSITY OF SOUTHERN MISSISSIPPI GULF COAST RESEARCH LABORATORY
Skidaway Institute of Oceanography
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THE MARY C. O'KEEFE CULTURAL CENTER FOR ARTS AND EDUCATION OCEAN SPRINGS, MS
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