On April 20, 2010, the Deepwater Horizon, which was drilling the Macondo well in the Gulf of Mexico just off the Louisiana coast, exploded, burned, and sank (see photo, opposite page). The well was in nearly a mile (1,600 m) of water, and had reached oil at a depth of 13,960 ft (4,200 m) below the seafloor when a bubble of methane gas shot up through the drill pipe, expanding quickly as it rose and bursting into flame when it reached the surface. The seals and safety barriers designed to prevent escaping gas failed. After burning for about a day, the $560 million drill rig capsized and sank. Eleven workers were killed and 17 others were injured.

Crude oil gushed out of the ruptured drill pipe. BP, the company that owned the well, claimed the spill was about 5,000 barrels per day, but others said that it was at least ten times as much. Despite a number of efforts by BP to cap the well or to inject heavy drilling mud to stop the flow, oil continued to pour into the Gulf. Finally, after four months of drilling, a relief well intersected the damaged borehole just above the spot at which it entered the oil reservoir. This allowed engineers to pump cement into the bottom of the well and seal it permanently.

Altogether, it’s estimated that about 5 million barrels (800 million l) of oil were released into the Gulf, making this the largest accidental marine oil spill in world history. It was about 20 times as much oil as was spilled in the wreck of the Exxon Valdez in Alaska in 1989. We don’t yet know the total impact of this disaster, but the effects on marine life, fishing, and tourism (which bring in about $34 billion annually to Gulf States) could be tragic and long-lasting. Six months after the spill, the Fish and Wildlife Service reported that 6,100 birds, 610 sea turtles, and 100 dolphins died from oil contamination (fig. 19.1). It’s estimated that 20 percent of the juvenile bluefin tuna in the Gulf were killed by oil pollution in one of the species’ most important spawning areas. This could be a serious blow to an already endangered population.

On the other hand, several factors may reduce ecological damage from the spill. The oil was released in deep water so it had a much greater chance to disperse than if it were in shallow, coastal water. Furthermore, the Gulf water is warm, which speeds up evaporation and metabolism by microorganisms. The Gulf has natural seeps that release about 1,000 barrels of oil per day, so many microbe species were already adapted to metabolize oil. And a government study concluded that nearly three-quarters of the oil was either recovered at the wellhead, dispersed, dissolved, evaporated, broken up by chemical treatments, burned, or skimmed from the ocean surface.

The use of chemical dispersants remains controversial. Altogether, BP sprayed about 1.8 million gallons (6.8 million liters) of a chemical mixture called Corexit either on the ocean surface or next to the gushing wellhead. This solvent mixture is known to be toxic, although no one knows what the effects of such a large amount in the ocean will be. The dispersant was successful in preventing much of the oil from reaching the shore, where it would have been a public relations nightmare for BP, but it also created huge plumes of tiny oil droplets deep under water where it may be more toxic to fish and other sea life than if it had been on the surface.

Immediately after the spill, the companies involved began blaming each other. Although BP owned the well, they had subcontracted with Transocean, which owned the Deepwater Horizon, to do the drilling, while Halliburton supplied the drilling mud, cement, and other supplies. Both subcontractors claimed that BP pressured them to take shortcuts and avoid safety warnings to cut costs. One of the most critical errors was to use a defective blowout preventer on the well. This apparatus is a giant valve that’s supposed to be the last line of defense, with huge shears that can cut off the well and prevent a gusher. But the one BP chose had a dead battery, deblitting hydraulic-system leaks, and shears that weren’t strong enough to seal the well. It had failed several crucial safety tests, but was used anyway.

A government investigative committee concluded that all three firms made bad choices: "Whether purposeful or not, many of the decisions that BP, Halliburton, and Transocean made that increased the risk of the Macondo blowout clearly saved those companies significant time (and money)." Discovery of offshore deposits has substantially increased our oil and gas supplies, but our addiction to fossil fuel is forcing us to look in ever more dangerous and expensive places for energy.

In this chapter we’ll examine the fossil fuels and nuclear sources that now provide 90 percent of our energy. In chapter 20 we’ll look at some renewable energy alternatives. For related resources, including Google Earth™ placemarks that show locations discussed in this chapter, visit EnvironmentalScience-Cunningham.blogspot.com.