Environmental Case Study
The Wreck of the Exxon Valdez

At 9 P.M. on March 23, 1989, the tanker Exxon Valdez cast off from the Alyeska oil terminal in Valdez, Alaska, and began moving slowly down the narrow, twisting fjord toward Prince William Sound and the Gulf of Alaska. Loaded with 1.2 million barrels of crude oil (50 million gal), the huge ship moved ponderously through the cold night. More than 300 m (987 ft) from stern to stern, this behemoth is as long as a 50 story building is tall. If your city has a building that big, go look at it and imagine laying it on its side and driving it through high waves and shifting currents down a narrow, rocky channel on a dark night.

About two hours after leaving the terminal, Captain Joseph Hazelwood radioed the Coast Guard to say that he was moving the ship from the normal outbound shipping lane to the inbound lane to avoid floating ice. A few minutes later, Hazelwood, whose license was later revoked for drinking while on duty and negligence in leaving the bridge, turned over control of the vessel to Third Mate Gregory Cousins and went to his cabin.

Nine minutes later, at 12:04 A.M., the Valdez ran aground on the well-marked Bligh Reef, ripping eight huge gashes in its hull. Gooey, foul-smelling crude oil gushed from the ruptured hull at a rate of 76,000 l (20,000 gal) per hr. Calls for help went out immediately, but it took nearly twenty-four hours for the Alyeska Oil Spill Team to assemble its gear and reach the site. The barge that was supposed to be loaded and ready to go at all times was damaged and barely seaworthy. Hoses, lights, and containment booms were missing or inoperable. By the time the flow was staunched many days later, about 250,000 barrels (11 million gal) of oil had hemorrhaged into the ocean. Promises that an accident of this size could not possibly happen and that a response would be mounted within three hours if it did, obviously were empty rhetoric.

Hopelessly unprepared and understaffed, there was little that the Oil Spill Team could do to scoop up the viscous, black crude oil. Only 10 percent was ultimately recovered. The rest evaporated or spread over 4,600 km$^2$ (1,800 mi$^2$) of Prince William Sound. More than 2,500 km (1,560 mi) of pristine beaches and rocky islands were smeared with a filthy, smelly, oily sludge that stuck to everything it touched. More and more workers were rushed to the scene as the massive oil slick spread inexorably across the sound, along the coast, and into Kenai Fjords and Katmai National Parks.

As the oil slick spread, workers began bringing in oil-soaked birds and mammals. Emergency treatment centers were overwhelmed. Wildlife experts estimate that between 100,000 and 300,000 sea birds were killed by the oil. Some were poisoned from ingesting toxic chemicals, some died from starvation or exhaustion trying to swim through the sticky crude, but most died from hypothermia when oil-soaked feathers lost their insulating capacity. Bald eagles were poisoned or fouled by eating contaminated fish and birds. A 1989 survey found 60 dead eagles and no surviving chicks in any of the nests around the sound.

Alaska has the largest remaining sea otter population in the world, and Prince William Sound is the center of their range. At least 1,000 otters were contaminated and about 80 percent of them died from hypothermia and poisoning. Teams of dedicated volunteers and wildlife professionals worked to save otters that were brought into rescue centers. In spite of the care and attention, however, mortality rates were very high. Oil is much more toxic to marine mammals than had been supposed. More than two-thirds of the dead animals had lung damage from oil fumes. Many also had liver, kidney, or spleen abnormalities. The $18.3 million paid by Exxon for otter recovery works out to $51,260 apiece for each of the 225 surviving animals.

Fortunately, fish seem to have been less adversely affected by the oil than was first feared. Prince William Sound is one of the richest and most productive fisheries in the world. Every year millions
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of pink salmon pass through the sound on their way to spawn in the cold, clear rivers that tumble down the mountain valleys. The fish catch is worth about $90 million per year, and most of the villages around the sound live entirely on fishing and tourism. In 1989 the harvest was a disaster, as least in part because many crews were making more money working on the cleanup than fishing.

Some 43 million salmon were caught in 1990, however, far more than the previous record of 29 million in 1987. Pink salmon have a two-year life cycle. Many of the fish harvested in 1990 were either hatched in waters fouled by the Exxon Valdez or swam through the area on their way to the open ocean. Apparently, neither the young salmon nor the plankton, their main food at that stage, were irreparably damaged by the oil.

During the summer of 1989, more than 10,000 people worked scrubbing rocks and spraying oil-fouled beaches. It was mostly a futile exercise: as quickly as the surface oil was removed, more washing in from offshore or oozed up from beneath the rocks. In the first work season, only 3 percent of the shoreline was cleaned satisfactorily. Exxon spent about $2 billion in 1989 and another $200 million in 1990 on this effort.

Interestingly, the most effective cleanup was done by nature. Over the winter, fierce storms and pounding waves scoured at least 75 percent of the surface oil and half of the buried oil from the beaches. At the start of the 1990 season, only 160 km (100 mi) of shore remained badly contaminated. By September, when work stopped again for the winter, only 6 km (4 mi) was still considered heavily oiled.

Often the best way to clean oil contaminated beaches is to just let nature take its course. A technique called bioremediation works on this principle. Instead of blasting the beach with high-pressure steam that washes off surface oil but also kills all living organisms, bioremediation encourages growth of creatures that metabolize the oil. Spreading fertilizers and straw stimulates growth and recovery of natural ecosystems. In some cases, microbes genetically engineered to consume oil are spread over the area to speed up natural processes. The Alaskan beaches treated by bioremediation looked considerably healthier more rapidly than those scrubbed and steamed. This is also much cheaper than the brute-force approach. One of the heartening lessons learned from this terrible episode is that nature may be more resilient and less fragile than we generally suppose.

Perhaps the most shocking fact about the wreck of the Exxon Valdez is that the 11 million gal it spilled represent only about 5 percent of the total oil spilled or dumped worldwide in 1989. With 20 billion barrels of oil pumped and shipped around the world every year, oceans and land inevitably will be fouled by oil and its by-products in the future. Unless we curb our insatiable appetite for oil and our wasteful habits in using it, similar accidents are bound to occur.