

# Consequences of a large oil spill in the Arctic

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In March 1989 the oil tanker Exxon Valdez grounded on Blight Reef in northern Prince William Sound in Alaska and caused one of the largest marine oil spills ever recorded. More than 42 million liters of crude oil were released into the blight and caused an ecological catastrophe of unprecedented magnitude, with a contaminated pristine shoreline of at least 1990 km and evident high wildlife mortality. After the oil spill, acute mortality of wildlife was observed, primarily affecting marine mammals and seabirds due to their routine contact with the sea surface. A few drops of oil punctuate the fur and feather isolation coats present in these animal groups, and may lead to hypothermia (freezing), but may also cause smothering, drowning or ingestion of toxic hydrocarbons. Between 1000 and 2800 sea otters, 302 harbour seals and more than 250000 seabirds were killed following the first days after the oil spill. Additionally, mass mortality of macroalgae and benthic invertebrates (bottom-dwelling animals such as shrimp) were also recorded.

Long-term consequences of the oil spill have been reported since 1989. In 2003, 14 years after the accident, Science published a review that summed the main ongoing sufferings from the oil spill (see Peterson et al. 2003). This review concluded that the “*oil persisted beyond a decade in surprising amounts and in toxic forms, was sufficiently bioavailable to induce chronic biological exposures, and had long-term impacts at the population level*”. The chronic exposure enhanced mortality for years in fish embryos and larvae. Otters born after the oil spill experienced high mortality due to contaminated sediment contact and ingestion of contaminated bivalve prey. Many sea birds showed evidence of persistent exposure to residual oil after the spill, and some populations did not recover to pre-oil-spill population sizes.

Several studies documented cascades of events indirectly affecting individual survival or reproduction after sublethal exposures. Oil exposure resulted in lower growth rates, reproductive impairment and abnormal developments in fish and reduced incidence of breeding and smaller eggs in sea birds. Cascades of indirect effects were also present after the oil spill, where indirect interactions lengthened the recovery process on rocky shorelines for a decade or more. For example, an initial loss of cover habitat led to losses of important grazers and promoted blooms of unwanted ephemeral green algae and opportunistic barnacles.

The synthesis of 14 years of Exxon Valdez oil spill studies documents the contributions of delayed, chronic and indirect effects of petroleum contamination in the marine environment. With this knowledge, today’s risk assessment models to predict ecological impacts of petroleum activity should not be limited to selective short-term effects of oil spills and tests of acute toxicity in laboratory tolerant taxa, but should also include long-term effects of an accident.

Main source:

Peterson et al. (2003) *Long-term ecosystem response to the Exxon Valdez oil spill*. Review in **Science** 302: 2082-2086