

What Petroleum Dependency Means to Aquatic Ecosystems

Thirty three years after a barge spilled thousands of gallons of fuel oil a few miles off the coast of Massachusetts, researchers visited a marsh contaminated by the spill. They dug their hands into the spongy earth and found that fuel oil was still there, two to 11 inches beneath the surface.

These residues from the 1969 spill at Buzzard's Bay are in approximately the same concentrations as found soon after the accident, which indicates that this particular site will likely always be contaminated, say scientists with the Woods Hole Oceanographic Institution in Woods Hole, Mass.¹



Photo U.S. Fish and Wildlife Service

The Arctic National Wildlife Refuge, shown here, could be opened up for oil drilling in the future.

"I am not surprised that the effects of oil spills last so long," said Dr. John Teal, a marine biologist at Woods Hole Oceanographic Institution. "Some of the oil always gets into sediments where it is protected from atmospheric oxygen

and lasts for long times. After all, the oil that we get out of the earth has lasted in oxygen-free sediments for geological ages."

"Oil can surface and recontaminate the active environment in storms and when animals dig in the sediments," he said.

Oil is not only persistent. It's also highly toxic.

Seventeen years after the Exxon Valdez oil tanker disgorged 10.9 million gallons of thick black crude into Prince William Sound, Alaska, an ecological wonderland rich in marine life, at least 10 wildlife species have yet to recover.²

For four years after the Exxon Valdez accident, oil in Prince William Sound's streams was absorbing into the yolk membranes of salmon and herring eggs, causing long-term genetic damage to embryos and larvae.³ At concentrations of crude as low as .4-1 parts per billion,⁴ there were massive numbers of dead eggs, as well as hatchlings with severely deformed spines and jaws.⁵ The young suffered stunted growth⁶ and were less able to avoid predators or catch prey, resulting in population declines.⁷

Just breathing the fumes of crude oil can damage the central nervous system, liver and lungs of wildlife species. Observers say oiled seals in the Exxon Valdez oil spill appeared sick, lethargic or drugged.⁸ Autopsies revealed lesions in

their brains with swelling resembling damage seen in humans who have been sniffing glue or hydrocarbon solvents.⁹

Rescued birds and turtles in oil spills often have chemical burns on their feathered and nonfeathered skin, ulcerated corneas¹⁰ and blindness.¹¹



Photo NOAA

When oiled animals or birds try to clean their feathers or fur, they can ingest petroleum, causing ulceration and hemorrhages in their gastrointestinal tracts, bloody diarrhea and damage to their livers as their livers work to detoxify the chemicals. They may develop necrosis (dead tissue) in their brains, kidneys and lungs, as well as respiratory distress and seizing.¹²

Oil smeared on the feathers of birds can get on their eggs and kill their unborn chicks.¹³

After the Exxon Valdez oil spill, mussels absorbed and sequestered oil in their tissues for a decade. The toxins moved up the food chain, impairing the health of otters, sea ducks, shore birds and other species that fed on the mussels or on benthic invertebrates that ingested oil.¹⁴ Oil is still trapped under mussel beds and scientists say these oiled beds could be contaminated for 30 years.¹⁵

Birds, as well as animals, such as otters, sometimes freeze in oil spills because when oiled, their fur and feathers lose their insulating properties that keep them dry and warm.¹⁶ And as the intricate structure of bird's feathers gets matted with oil, they lose their ability to float, which in turn affects their ability to forage for food.¹⁷

Heavy oiling pastes the feathers, wings and legs of birds to their bodies.¹⁸ People have seen them running hysterically, flapping their wings, but unable to fly.

Turtles in oil spills sometimes starve when tarballs get stuck in their beaks, esophagi or guts or tar gets caked in their jaws.¹⁹

Another problem is that the habitats of organisms, including the vegetation they depend on for food, water or shelter, may get coated with a hard black asphalt coating, making survival difficult.²⁰ Eight years after the 1989 spill, villagers in Valdez gathered to scour hardened asphalt-like oil from rocks.²¹

Scientists estimate that the Exxon Valdez oil spill killed approximately 250,000 seabirds, 2,800 sea otters, 300 harbor seals, 250 bald eagles, 22 killer whales and billions of salmon and herring eggs.²² The oil also smothered vertebrates and impacted barnacles, fish, limpets, periwinkles, clams, amphipods, isopods, marine worms, small crustaceans, eelgrass and other types of biota.²³

Many fish-eating seabirds and harbor seals not killed by the oil still suffered population crashes when their prey, herrings, were killed by the oil.²⁴

Scientists say that pelicans rescued in oil spills off the California coast may survive only one or two years, may not engage in breeding activity, and if they do breed, may not be attentive to their nests or may abandon their nests.²⁵

As devastating to aquatic ecosystems as petroleum is, more than 14,000 oil spills are reported to the U.S. Environmental Protection Agency or the U.S. Coast Guard every year.²⁶

Furthermore, scientists say about one quart of oil for every person in the United States washes off highways in rainstorms into streams or storm sewers that discharge into harbors and rivers. This is an amount of oil equivalent to the Exxon Valdez oil spill for every 50 million people -- every year, year after year.²⁷

Oil is also making its way into water bodies as households and businesses dump oil down the drain after oil changes.²⁸ One quart of oil is enough to pollute a million gallons of water.²⁹

Millions more gallons of petroleum enter our waterways each year during drilling and routine daily extraction activities,³⁰ along with massive quantities of "produced water" -- water brought up with the oil that is tainted with radioactive substances Ra 226 and Ra 228 and other toxic pollutants.³¹

Continuous spills from extraction and refining stations in the Persian Gulf mean that waterways in that area are among the most polluted areas in the world.

Aquatic ecosystems are also impacted as petroleum is burned by automobiles, homes and businesses. Millions of gallons of fossil fuel hydrocarbons from engine exhaust accumulate in the atmosphere each year.³² The pollutants react to form acid rain, which is so toxic to aquatic biota that 14,000 lakes in Canada are biologically dead. An additional 100,000 Canadian lakes are impaired and 600,000 are estimated to be at risk.³³

Also, as petroleum is burned, polycyclic aromatic hydrocarbons (PAHS) accumulate in sediments in aquatic ecosystems, causing tumors and lesions in fish.³⁴

Moreover, nitrogen oxides from the combustion of fossil fuels contribute to stratospheric ozone depletion, according to Dr. Paul Crutzen, who won a Nobel Prize for Chemistry in 1995 for his 1970 discovery. Life on earth can not exist without an ozone layer. The unfiltered, piercing ultra-violet radiation can impact oceans by reducing levels of plankton, tiny plants and animals at the base of the aquatic food chain.³⁵

Fossil records show that a large loss of tiny plankton the size of a grain of sand once caused a mass extinction where about two-thirds of life on earth died. It took the earth 10 million years to recover.³⁶

Drilling for oil may be the worst mistake mankind has ever made.

End Notes:

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⁷ Ott, Riki; Peterson, Charles; Rice, Stanley, "Exxon Valdez Oil Spill (EVOS) Legacy: Shifting Paradigms In Oil Ecotoxicology," available on the WWW at: www.alaskaforum.org/Dan_Uploads/riki_paper.PDF.

⁸ "Impacts on Species," on the EPA's Oil Program website at: <http://www.epa.gov/oilspill/impact.htm>.

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¹¹ "National Ocean Service Education Discovery Stories: How Toxic is Oil?" available on the NOAA's National Ocean Service website at http://www.oceanservice.noaa.gov/education/stories/oilymess/supp_toxic.html.

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- ³⁰ "Ocean Planet," a 1995 Smithsonian Institution traveling exhibition, on the WWW at http://seawifs.gsfc.nasa.gov/OCEAN_PLANET/HTML/peril_oil_pollution.html.
- ³¹ Hearing on Solutions to Competitive Problems in the Oil Industry before the Judiciary of the United States House of Representatives, testimony by Daniel Lashof, senior scientist with the Natural Resources Defense Council, available on the WWW at: <http://www.house.gov/judiciary/lash0407.htm>. See also, Foyn, L. "Produced Water From Off-Shore Oil and Gas Production, a New Challenge in Marine Pollution Monitoring," *Marine Pollution*, July 1999, pp.474-476.
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