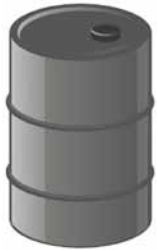


# 6. Lessons from Alaska



**1 barrel**  
= 42 US gallons  
= 35 Imperial gallons  
= 159 litres  
**1 tonne**  
= 1,000 kg  
= 7 barrels

At 42 million litres, the Exxon spill would fill 17 Olympic swimming pools.



**Exxon Valdez grounded on Bligh Reef, Prince William Sound** The *Exxon Valdez* spilled more than 40 million litres of oil into Alaskan waters in 1989 when the supertanker went aground on Bligh Reef. Although one of the world's most famous and best-studied oil spills, it does not even rank among the top 50 largest spills. An [overview of the Exxon Valdez Oil Spill](#) and the lingering impacts can be viewed here (EVOS Trustee Council).

PHOTO: NOAA.

## The *Exxon Valdez* oil spill

The story lives on, but began just after midnight on March 24, 1989 when the 300 metre (984 feet) supertanker *Exxon Valdez* ran aground on Bligh Reef, 50 kilometres from the port of Valdez, Alaska. In its hull were 220 million litres (53 million US gallons) of crude oil, which began leaking into Prince William Sound.

Three days passed before Exxon, the owner of the vessel, began cleaning up the oil. Meanwhile, at least 42 million litres (11 million US gallons)<sup>81</sup> of leaked oil had drifted more than 25 kilometres from the punctured supertanker. Within a week, crude oil stretched more than 140 kilometres, contaminating shorelines and killing wildlife across much of Prince William Sound, and out into the Gulf of Alaska. The oil slick eventually expanded 750 kilometres, covered 3400 square kilometres, and contaminated 1,990 kilometres of shoreline.<sup>82</sup> Based on the recovery of carcasses, immediate mortalities<sup>83</sup> included: 1,000-2,800 sea otters, 250,000 seabirds, 302 harbour seals, and countless intertidal invertebrates, such as clams and mussels, as well as beds of seaweed.<sup>84</sup>

## Oil: A killer for whales

Prince William Sound is home to two types of killer whales: fish eating resident and mammal-eating transient whales. Killer whales are long-lived and slow to reproduce. Females give birth about every five years and typically produce only four to six calves throughout their lifetimes. Each whale is unique in its markings and fin shape, so it is possible to census the population with great accuracy.



**Death by oil.** Between 1000-2800 sea otters (above) and 250,000 seabirds (below) died immediately following the *Exxon Valdez* oil spill. Oil on the fur of otters or on the feathers of seabirds causes loss of insulation and often leads to death from hypothermia, smothering, drowning, and ingestion of toxic hydrocarbons. Harbour seals and killer whales were thought to have died from inhaling the toxic fumes of the oil. PHOTO, ABOVE: NOAA. PHOTO BELOW: EVOS TRUSTEE COUNCIL

### **The AT1 transient killer whales<sup>85</sup> (mammal-eaters)**

Before the *Exxon Valdez* oil spill, the AT1 transient population was stable at 22 whales. Although nine whales disappeared immediately after the spill, it took years to confirm these missing whales had died. This is because transient social structure is somewhat fluid. Individuals will sometimes leave their groups for varying lengths of time. However, in the 15 years following the spill, these individuals were not seen with any other groups and did not reappear in Prince William Sound, leading to the conclusion they had died.

Since the spill, 15 transient whales have gone missing from the AT1 group, a number of which were females. Although only five carcasses were ever found, these whales are almost certainly dead. Moreover, over the last 20 years no recruitment of calves into this population has been recorded. All evidence shows that this unique population of killer whales is going extinct. The timing and magnitude of missing individuals directly following the spill plus the known exposure of the AT1 pod to the oil (they are a year-round resident of Prince William Sound) suggests that oil was the cause. Scientists have hypothesized that these whales died from inhaling toxic oil vapors or from eating oiled harbour seals.<sup>86</sup>

### **The AB resident killer whales (fish-eaters)**

Similar to the story of the transient killer whales, the link between the decline of the resident population and the oil spill was not immediately obvious. No carcasses of any resident whales were ever discovered. As with the transients, the resident whales were observed surfacing in oil slicks immediately following the spill and nearly all of the deaths occurred between then and over the following winter. The mortality rate was 19% in 1989 and 21% in 1990, roughly 10 times the natural rate.

Fourteen of 36 whales died in the AB pod, many of which were young and reproductive females. Although calves have been born into this population, unexpected mortalities and the loss of these important females has meant an uphill battle for recovery. Mortality and impacts are likely due to petroleum or petroleum vapors inhaled by whales.<sup>87</sup>



**Alaskan resident killer whales (AB Pod).** Although no oiled carcasses were recovered, two different populations of killer whales, both in Prince William Sound at the time of the spill, experienced dramatic declines. The whales shown here are members of the fish-eating AB resident pod. This group of killer whales lost 14 of its 36 members following the spill. A second population, the AT1 mammal-eating transients, which were seen surfacing in the oil near the *Exxon Valdez*. Since then, the group has not successfully reproduced. Most likely, this unique killer whale population will go extinct.<sup>88</sup>

PHOTO: K. HEISE/L. BARRETT-LENNARD

## Exxon oil lingers on

“Twenty years later, the lingering ecosystem effects of the *Exxon Valdez* oil spill continue to affect the social fabric of native villages and communities. In some areas, subsistence gathering of intertidal resources has never resumed and commercial herring fisheries, worth millions of dollars remain closed”.<sup>91</sup> EVOS TRUSTEE

COUNCIL 20 YEAR REPORT

The effects of the spill on wildlife populations in Prince William Sound have been long-lasting. Scientific studies have shown that Pacific herring, an important commercial species, and pigeon guillemot (a seabird in the alcid family) populations have failed to recover after more than 20 years. Still recovering are sea otters, killer whales, and other marine birds such as Barrow’s goldeneyes and harlequin ducks. Sediments and intertidal communities are also contaminated and slowly recovering, including the clams and mussels that provide nourishment to so many maritime animals.<sup>89</sup>

For many marine and terrestrial species, the baseline information on species numbers and distribution that are necessary to measure recovery were never collected, a fact often overlooked in the reports and studies of recovery following the *Exxon Valdez* oil spill. For example, we have no idea how the spill affected harbour porpoise and Dall’s porpoise populations in Prince William Sound. Over 90 different species of oiled birds were recovered from the spill, but it has only been possible to track 10 bird species for signs of population level recovery.<sup>90</sup>

## The toxicity of oil

When encountering an oil spill, one of the first things you notice is the smell. Impossible to capture in a photograph, it leaves a lasting impression. The strong-smelling vapours from crude oil contain toxic carcinogens, such as polycyclic aromatic hydrocarbons (PAHs). Consequently, spilled oil needs to be treated as hazardous waste. Oil spill clean up workers have shown evidence of long-term respiratory illness and even death as a result of exposure to oil.<sup>92</sup>

The *Exxon Valdez* oil spill has caused a shift in the way we now think about the persistence of oil in the environment. Previously, the assumption was that mortality in wildlife was almost exclusively from acute exposure. However, this spill has taught us that oil persists and retains its toxicity for a much longer time than originally thought. The persistence of toxic, sub-surface oil and chronic exposures, even at low levels,

## Toxic Oil: Acute and chronic effects

Crude oil is a complex mixture of hydrocarbons and other compounds. Oil's toxicity is based on its ability to cause harm through acute (immediate) and chronic (repeated) exposure. Crude oil and other petroleum products also contain polycyclic aromatic hydrocarbons (PAHs), many of which are carcinogenic. Animals can be exposed to the toxicity of oil by swimming through it, breathing the vapours, consuming it on their food, or ingesting it when trying to clean their feathers or fur.



**Cosco Busan Oil spill.** In November 2007, the 277 metre container ship *Cosco Busan* collided with the San Francisco Bay Bridge, spilling an estimated 220,000 litres (58,000 US gallons) of heavy fuel oil into the Bay. Although the spill occurred within the harbour, clean up efforts were not mobilized in a timely way and the oil spread. Volunteers could not be used because of the oil's toxicity. The estimated costs of clean up were more than 70 million \$US, excluding long-term restoration or socio-economic expenses. PHOTO: GCAPTAIN.COM

continues to affect wildlife in Alaska.<sup>93</sup> After twenty years, five to seven centimetres (two to three inches) beneath the surface, more than 80,000 litres (21,100 US gallons) of oil remain nearly as toxic as during the first few weeks after the spill.<sup>94</sup>

Mussels and clams in the lower intertidal continue to be exposed to this toxicity and the harlequin ducks, sea otters, and other species that feed on them are thus exposed to PAHs.<sup>95</sup> This is why in oiled areas, recovery for many species has been slow.

## Can we realistically estimate the costs of spill cleanup?

To help industry and governments better budget for such occurrences, economists have tried to predict the costs of oil spill clean up. Globally, the cost to industry for spill cleanup averages 16,000 US dollars per tonne (1110 litres).<sup>96</sup> However, this estimate does not account for the costs of restoring habitat or the social fabric of the communities impacted by the spill.

In 2003, the cost of cleaning up a 378,000 litres (100,000 US gallons) heavy fuel oil spill in San Francisco Bay was an *estimated* 93 million US\$.<sup>97</sup> Forty to sixty percent of the estimated cost was attributed to restoring habitat and compensating for socio-economic losses. However, in 2007 when the *Cosco Busan* spilled a little over half that amount into the Bay, the cost for the clean up alone was 70 million US\$ (see sidebar).<sup>98</sup> In other words, true costs dramatically exceeded the estimates.

### Did Exxon pay the full cost of the Exxon Valdez oil spill?

Although Exxon spent more than 3.4 billion US\$ and the spill was the most expensive in history, the true costs were estimated to be 9.5 billion.<sup>99</sup> Ultimately, US citizens ended up paying the additional costs.