



## Effects of Oil on Wildlife

### Effects of Oil Type

Even short term exposure to lighter, more volatile petroleum products (such as kerosene and jet fuel) can have dramatic impacts. These products frequently cause significant burns, eye irritation, neurological signs, and lung damage from inhalation of fumes. Heavier products (such as crude oil) most obviously affect waterproofing, but may also cause physiological problems when ingested or absorbed through the skin. Additionally, crude oil may contain numerous uncharacterized and potentially dangerous compounds.

It is important to note that even non-toxic oils, such as vegetable oil and fish oil, can be extremely damaging to wildlife because they affect the physical structure of feathers and fur, causing a loss of waterproofing similar to petroleum oils.

Read below to learn some of the ways oil impacts seabirds and marine mammals.

## Impacts to Seabirds

### Feathers & Skin

The primary problem caused when oil contacts a bird is a physical alteration of the feather structure. Feathers are made up of an interlocking structure of barbs and barbules - similar to Velcro(r) - that keeps cold water out and warm air next to the skin. Natural oils produced by the bird help to condition the feathers so they do not break as readily, but they do not directly aid in waterproofing. When oiled, feathers lose this ability to trap air and repel water. As a result, birds no longer maintain body heat and become hypothermic. To combat this decrease in body temperature, their metabolism increases, causing a greater need for food. At the same time, these birds do not float well; their swimming and foraging ability decreases; and they often cannot fly and will haul out of the water. Lighter, more volatile petroleum products (such as kerosene and jet fuel) can also cause significant skin burns and eye irritation.

### Internal Organs

Because birds preen themselves meticulously to maintain their insulating air layer, external oiling almost always leads to some oil ingestion. Once oil is ingested, it can cause direct damage to the gastrointestinal tract, evidenced by ulcers, diarrhea, and a decreased ability to absorb nutrients. If the volatile components of the oil are inhaled, it can lead to pneumonia, neurological damage, or absorption of chemicals that can lead



to cancer. Metabolism of the oil components by the kidney and liver can lead to extensive damage to those organs as well. Lastly, oil (and the stress of being oiled) can cause birds to have significant anemia and the lack of blood cells that combat infection.

## **Reproduction**

Oil can have drastic effects on each stage of bird reproduction. Studies on the effects of a single drop of oil on eggs from different species of birds have shown significant mortality and developmental defects in affected embryos. Other research has shown increased abandonment of hatchlings as well as alterations in breeding activities by adult birds.

## **Populations**

Long-term effects of oiling on bird populations are difficult to assess because of the challenges with following animals after release. Early post-release studies showed that birds did not survive well after oiling, and therefore may not have significantly contributed to the population as a whole. These studies, however, used few data upon which to base their conclusions. This lack of information is actively being addressed by the OWCN through the funding of selected post-release research projects. These studies suggest that birds survive for longer periods of time following oil exposure and rehabilitation than previously reported. Other studies conducted following rehabilitation (using non-OWCN protocols) have found variable survival rates and behavioral effects of oiling and rehabilitation in pelicans, coots, murre, and penguins.

## **Impacts to Marine Mammals**

### **Hair/Fur and Skin**

Different classes of marine mammals experience different consequences from external oiling. Heavily furred animals, such as sea otters and fur seals, rely on a thick haircoat to maintain warmth and buoyancy. The fur traps a thin layer of air adjacent to the animal's skin similar to the way feathers function in birds. This air layer insulates the body against the surrounding cold ocean water. When exposed to oil, the alignment of the hairs is altered, and the air layer is destroyed. Cold sea water is able to seep through the contaminated fur and causes the animal to rapidly become hypothermic.

For marine mammals without heavy haircoats (such as other species of seals, sea lions, dolphins and whales), problems associated with hypothermia are less of a concern because a thick blubber layer protects them from the cold. Young mammals are an exception to this, as they often have not yet developed this layer. Direct contact with the skin and mucous membranes puts all exposed animals at risk of painful chemical burns that also may become infected.



## **Internal Organs**

Oiled marine mammals that spend a large amount of time grooming (e.g., sea otters) are at great risk of ingesting oil on the haircoat. Prey items may also be affected by oil spills and serve as a potential source of ingested petroleum products. Once ingested, oil can cause direct injury to the gastrointestinal tract, which can impair the ability to digest and absorb food. Metabolism of absorbed oil components by the kidney and liver can cause extensive damage to those organs as well. Volatile fumes released from oil in the environment, as well as on skin and hair, can irritate or injure the respiratory tract leading to inflammation and pneumonia.

## **Reproduction**

Research by OWCN staff has shown that internal exposure to oil in mustelids (e.g., sea otters) can cause decreased birthrates even several generations past the initial exposure. In the field, oil spills have been shown to cause increased mortality in young animals, as well as pup abandonment in sea otters. In orca following the Exxon Valdez spill, two pods lost approximately 40% of their numbers. Since that time, the reproductive capacity of these pods has been reduced by the loss of females, with only about half of newborn calves surviving.

## **Effects on Populations**

Southern sea otters are considered a keystone species for the nearshore kelp forest ecosystem. They range from Pt. Año Nuevo to Pt. Conception, making the species highly vulnerable to spills in this area. A significant offshore event has the potential to decimate this species, and by extension the kelp forest ecosystem.