What Are the Effects of the Oil Spill?



Wildlife Resources in the Sound

Prior to the spill, Prince William Sound was a pristine environment hosting a broad community of fish and wildlife.

Fisheries resources include five species of salmon, shellfish, finfish, and bottomfish. The total commercial fisheries value in the Sound in 1988 was about \$90 million.

Marine mammals include sea otters, harbor seals, Steller's sea lions, and cetaceans, such as killer whales, Dall porpoises, harbor porpoises, and grey whales.

Terrestrial mammals include Sitka black-tailed deer, black and brown bear, river otter, and mink.

Birds are numerous and diverse, with more than 300,000 resident in the Sound at the time of the spill and millions more migrating during the spring. During this time large numbers of seabirds also return to nesting colonies on the headlands and islands off the Kenai Peninsula such as the Chiswell Islands, the Barren Islands, and Shuyak Island just north of Kodiak Island.

The spill occurred at a particularly sensitive time of year. In the spring, zooplankton and phytoplankton—at the bottom of the food chain—are beginning to bloom. Salmon fry emerge from gravel beds in freshwater streams or are released from hatcheries to meet that bloom; and herring return to spawn. Sitka black-tailed deer, hungry at the end of winter, have come down to the beaches to feed on intertidal plants, and bears (both black and brown) are emerging from their winter denning. Birds are migrating and nesting. Seals and sea lions are pupping. Whales are migrating. The Sound, in spring, stirs with reproduction and development.



John Hyde

Commercial Fisheries

A major part of the economy of the affected area is commercial fishing. In 1988, the salmon fisheries in the Sound totalled \$76 million, herring, \$12.2 million, and shellfish, \$2.4 million.

By mid-May, the following fisheries had been closed in the Sound:

Herring: All spring herring fisheries: herring pounding, wild spawn on kelp, purse seine, and gillnet

Pot shrimp

Black cod (sablefish)

Trawl shrimp

Northern Area Dungeness crab (Prince William Sound proper)

Prince William Sound Bottomfish

Fisheries closed in Lower Cook Inlet:

Outer Cook Inlet Pot Shrimp

Cook Inlet Outer and Eastern District Bottomfish

Outer and Eastern District Sac Roe Herring

Fisheries closed in Kodiak:

Herring: Five herring fishing areas around Shuyak and Afognak Islands

The Mainland District herring fishing areas

The drift-gillnet salmon fishery on the Copper River Delta opened as scheduled May 15 under a state plan that called for extensive pre-fishery testing and continuous inspection for signs of contamination. ADF&G fishery biologists, working with DEC, the Federal Food and Drug Administration, the National Marine Fisheries Service, fishing groups, and hatchery operators, developed a program that allows an orderly fishery to harvest salmon stocks to the greatest degree possible while maintaining fish quality. In the Sound, approximately 760 drift and seine net salmon fishermen historically participate in the fishery.

The halibut opening called for May 15 also proceeded as scheduled. Halibut fishing is overseen by the International Pacific Halibut Commission and is undergoing the same rigorous pre-fishery testing and inspection system as is the salmon fishery.

Sport Fishing

Though it represents only a small percentage of angling effort, Prince William Sound has been known for excellent sport fishing for cutthroat trout and Dolly Varden char as well as coho salmon, halibut, and rockfish.

The present plan is that all sport fisheries in the Sound will remain open this summer unless there is reason to close them, such as contamination of fish or conservation problems. Increased creel census activity and testing of fish will help fishery biologists to monitor the sport fisheries in the Sound. Studies of anadromous cutthroat and Dolly Varden populations will also be conducted. Governor Cowper recently stated, "The oil spill is a great tragedy, but fortunately its effect on sport fishing will be minimal. We've received hundreds of inquiries from people who had planned to go sport fishing in Alaska this year or next year. Our message is: Don't cancel your plans. Alaska is twice the size of Texas, with more coastline than the rest of the lower 48 combined, and the vast majority of the state is unaffected by the spill. We expect sport fishing to be as good this year as it's ever been."

Marine Mammals

Alaska is famous for its abundant and diverse marine mammal fauna. From the icy waters of the Beaufort Sea to the heavily forested coast of Southeast, Alaska's residents and visitors frequently see seals, sea lions, sea otters, whales, and porpoises. The predictable occurrence of the animals in nearshore marine habitats is important to subsistence hunters, the tourism industry, and those who simply enjoy watching animals behaving naturally in wild and unspoiled areas.

The oil that spilled when the *Exxon Valdez* hit Bligh Reef on March 24, 1989, has impacted thousands of marine mammals and spoiled much of the habitat they depend upon for survival. It is unclear how severe the impacts will be on different species in different areas, and it may be years before the full effects are understood. Scientists, environmentalists, and oil industry representatives may never agree on how much damage has been caused by the spill.

From limited laboratory and field observations, we know that crude oil is a toxic substance that can harm marine mammals and other animals. Species such as the sea otter, which depend on clean fur for insulation, may die from hypothermia if they are oiled. Through contact, ingestion, or inhalation, the toxic components of oil may cause physiological damage to eyes, lungs, stomachs, liver, kidney, and the central nervous system. Behavioral effects may be significant, for example, if seal pups refuse to suckle on oiled mothers or if mothers cannot recognize oiled pups.

Possible impacts of the *Exxon Valdez* disaster are not limited to those from spilled oil alone. The intense and prolonged activity associated with spill response and clean-up has intruded into a once remote and peaceful environment. The presence of people and machinery will add to the stress put on animals by contact with oil and degradation of habitats.

From the point of view of impacts on marine mammals, the *Exxon Valdez* spill occurred at about the worst possible time, just before the peak pupping period for sea otters, seals, and sea lions, and just at the beginning of the spring-summer feeding season when animals concentrate in coastal waters to eat herring, krill, salmon, etc. Now, people are struggling to assess the initial impacts of the spill on marine mammal habitats. The number of animals that die directly or indirectly because of oil, the number of young that were never born, and the number of Alaska's coast, may never be known.



Rob Bosworth

Steller's Sea Lions

Steller's sea lions are one of the most conspicuous marine mammals in Prince William Sound. They are common in the area, especially in the spring when they range widely and feed on schools of herring that have returned to the Sound to spawn. They haul out on land, sometimes in groups of several hundred animals, at exposed, rocky locations such as Point Eleanor, the Pleiades, The Needle, and Point Elrington. Many sea lions leave the Sound and move to rookeries for the summer. Sea lion rookeries within the main spill impact area include Seal Rocks, Outer Island, Sugarloaf Island, and Marmot Island. Nonbreeding sea lions may remain in Prince William Sound all year. During summer they are often seen hauled out on navigational buoys, such as the one on Bligh Reef.

During and after the *Exxon Valdez* oil spill, sea lions were frequently seen swimming and diving in oiled areas. The oil did not obviously affect sea lion behavior and did not appear to accumulate on their hair or skin. Several important haulouts and rookeries were in the area impacted by the spill, but because of several factors, most sites were not heavily oiled. No sea lion deaths have been attributed to the oil spill. However, there are concerns that contact with oil may have toxic effects that will appear later. Of particular concern are possible effects on the health and survival of pups, which are born in July. The number of sea lions in the central and western Gulf of Alaska has declined greatly in recent years, and any additional stress put on the animals or their habitat is a major concern.

Harbor Seals

Harbor seals are widely dispersed throughout Prince William Sound and adjacent areas. They are usually seen hauled out on rocks, reefs, or glacial ice which they use as a substrate for resting, pupping, and molting. Several thousand harbor seals occur within Prince William Sound with perhaps one-third of those animals in areas that were impacted by the oil spill.

Many harbor seals, and some of the haulouts they use, were heavily coated with oil in the area hardest hit by the *Exxon Valdez* oil spill. Oil has accumulated on the skin and hair of seals, giving them a tarry, sticky coat. Oil has accumulated in thick bands and puddles on some haulouts.

Since the spill, several prematurely born pups have been found heavily coated with oil. One that was brought in alive has been cleaned and rehabilitated, and stands a good chance of survival. Some heavily oiled adult seals are acting very lethargic and are much easier to approach than normal. Dead, oiled adults have been found and are being examined to determine whether oil toxicity contributed to their death. There is particular concern for the possible effects on newborn seals born during the normal pupping period that starts in mid-May. In addition to the possible direct effects of oil, the activity and human presence caused by response and clean-up activities may also influence harbor seal behavior, haulout use patterns, and survival of pups.





John Hyde

Sea Otters

Sea otters have been the mammal most obviously impacted by the *Exxon Valdez* oil spill. Of the 5,000-10,000 otters thought to occur within Prince William Sound, penhaps 2-3,000 lived within the area impacted by the spill. Although the oil missed some of the areas with large concentrations of otters in the northwestern and southeastern parts of the Sound, the areas hardest hit were known to be used largely by females and pups. In spite of extensive efforts to capture and rehabilitate oiled animals, hundreds of sea otters have died in Prince William Sound, and others have been found dead as far west as the Alaska Peninsula.

It was expected that oil contamination could be harmful to sea otters because of their dependency on clean fur for warmth. However, studies of otters that died in the wild and at the rehabilitation center in Valdez indicate that toxic effects of

oil on lungs, eyes, liver, and kidneys have also contributed to the deaths.

The chances of long-term survival for otters that came in contact with the spill and lived through rehabilitation is unknown. It will be difficult to predict how long it will take for otters to reoccupy parts of the Sound from which they have been eliminated because oil may persist in important habitats.

Killer Whales

The killer whales that occur in Prince William Sound are fairly well known because of recent studies that have photographically identified individuals. These studies have identified a minimum of 230 individuals belonging to 10 pods. One group of over 30 individuals, known as the AB pod, is the most commonly seen by tourists, fishermen, and other individuals who work and recreate in the Prince William Sound area. They are also common in the Kodiak-Shelikof area.

Killer whales, including members of AB pod, were seen in and near oil slicks after the *Exxon Valdez* spill. Possible effects of oil on killer whale behavior and survival are unknown.

Humpback Whales

Humpback whales, an endangered species, are relatively common in Prince William Sound. Perhaps as many as 100 whales come to the Sound to feed in April-September. Additional whales feed in the Kodiak area.

Within Prince William Sound, there are certain areas where humpbacks are known to congregate in loose groups of 10-40 animals. Two of those areas are between Naked Island and Green Island, and the south end of Knight Island and Knight Island Passage. Both of those areas were heavily oiled during the *Exxon Valdez* spill, which may influence their suitability as feeding grounds.



Other Marine Mammals

Several other species of marine mammals occur in Prince William Sound, the Kodiak area, and the western Gulf of Alaska. Two species of porpoise—harbor porpoise and Dall porpoise—are common residents of the area. Some individuals of both species encountered oil spilled from the *Exxon Valdez*. This may be a particular problem for harbor porpoise that live in bays. fjords, and other coastal habitats, some of which have been very heavily oiled. Dall porpoise spend most of their time in deeper, more exposed areas, and may be less affected.

Minke whales, fin whales, and blue whales come to the northern Gulf of Alaska to feed during the summer. The number of animals that use the area impacted by the *Exxon Valdez* oil spill is unknown, but the northern Gulf is thought to be an important feeding area.

Gray whales and northern fur seals migrate through the northern Gulf of Alaska on their way to summering grounds in the Chukchi and Bering Seas. As oil moved from Prince William Sound into the northern Gulf, it spread over part of the area through which these species migrate. Contact with oil may be a particular problem for fur seals since it may foul their coats and affect both the seals and their pups, which are born on the Pribilof Islands in June.

Terrestrial Mammals

The terrestrial mammals most likely to be affected by the oil spill are river otters and mink, two species which feed on the intertidal zone, where heavy concentrations of oil are found. Small crabs make up the major part of the mink's diet (30 to 70 percent), and small fishes and invertebrates the rest. In searching for this food, the mink will go through kelp, running a high risk of contamination from oil. River otter depend on fish for about 70 percent of their diet, and on crabs and invertebrates for the rest. Both will feed on birds when available and are likely to scavenge oiled birds. Both species are likely to become coated with oil as well as to ingest it. Also, if their marine food resource is reduced, they will compete among themselves over depleted supplies.

Sitka black-tailed deer in the area traditionally winter on the forest beach fringe and are likely to ingest oiled kelp. It is known from studies of domestic cattle that cattle will ingest oilcontaminated food and die from toxic effects.

Black bear in the Prince William Sound area and the Kenai Peninsula and brown bear on the Alaska Peninsula are opportunistic feeders. When they emerge from winter denning, they will eat beach grasses and sedge, which might be contaminated with oil. They will also dig for clams in the intertidal area and will scavenge for birds. Canadian studies have shown that the toxic effects of crude oil can kill polar bears.

On the Alaska Peninsula, foxes commonly are found on the shoreline. Opportunistic feeders, they, too, will feed on oiled bird carcasses. Some coyotes are found on the Kenai Peninsula and run the same risk.



John Hyde

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Birds

Over 300.000 birds (mostly wintering birds) were in the Sound at the time of the spill, with approximately 200,000 more expected to return for the summer. Over 200 species of birds have been recorded in the region, including 111 species of waterfowl, shorebirds, seabirds, and other water-related birds. Soon after the spill, over one million waterfowl and ten million shorebirds passed through the area on their way north. This represents the largest migration of shorebirds in the world. Fortunately, many of these migrating birds stage (stop to feed and rest) on the Copper River Delta to the east of the Sound, an area that has not been impacted by oil. Large numbers of seabirds, such as kittiwakes, murres, puffins, and gulls, have also been returning from wintering areas to nesting colonies in the Sound, on the headlands and islands off the south shore of the Kenai Peninsula, and areas to the southwest where the oil has traveled. Some of these areas, such as the Chiswell and Barren Islands, are home to large colonies of nesting seabirds. It is estimated that 650,000 birds inhabit the Barren Islands during the nesting season.

Oil affects birds in two ways: direct oiling and ingestion. Oiling is the more obvious of the two. Feathers, which act as insulation, shed water and provide buoyancy to aquatic birds. Oiling mats the plumage. This leads to death from exposure or, in the case of marine birds and waterfowl, drowning. The second impact of oil on birds is less visible but just as lethal. That is ingestion, either from trying to clean oil from feathers or by scavenging or feeding on oiled food items. Ingested oil irritates the digestive tract, which may cause death from starvation or infection, or it can be absorbed into the system, causing death. Scavengers such as ravens, gulls, and eagles that scavenge on the carcasses of oiled birds may be especially susceptible to this process. At low levels of ingestion, reproductive success and development of young are retarded. Oil carried to the nest on the feet or body of nesting birds may also damage or kill eggs and young.

Bird populations most vulnerable to the spill appear to include alcids (including auks, puffins, guillemots, murrelets, and murres); loons, grebes, and sea ducks. Immediate mortalities appear significant for murrelets, which are small in size, murres, and loons that were exposed and in open water. Of great concern is the tiny marbled murrelet, a little-known species which nests in old-growth timber and which has died in large numbers in the Sound. Also of special concern are murres, which, like murrelets, have low rates of reproduction. They breed in large colonies in the Barren Islands, where oil has washed ashore. A large number of wintering and migrant loons (particularly the arctic-nesting yellow-billed loon) and grebes were caught in the spill, with unknown impacts on their populations. Approximately 1,800 to 2,000 pairs of eagles were resident in the northern Gulf of Alaska; many will be exposed to oil during their summer breeding season. An Exxon-funded program directed by the U.S. Fish & Wildlife Service has been designed to locate, retrieve, and rehabilitate oiled eagles and other raptors from throughout the spill area.



John Hyde

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