



## An Oily Mess HOME

### An Oil Spill Primer for Students

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#### **How much oil do we use and what do we use it for?**

The United States uses about 700 million gallons of [oil](#) every day. The world uses nearly 3 billion gallons each day. That this much oil must be transported every day is truly hard to imagine. However, if you think about all the ways we use oil, perhaps these numbers are not so surprising. We use oil:

- ▶ to fuel our cars, trucks, and buses, and to heat our houses.
- ▶ to lubricate machinery large and small, from bicycles to printing presses.
- ▶ to make the asphalt we use to pave our roads.
- ▶ to make plastics, such as the toys we play with and the portable radios and CD players we listen to.
- ▶ to make medicines, ink, fertilizers, pesticides, paints, varnishes, and electricity.

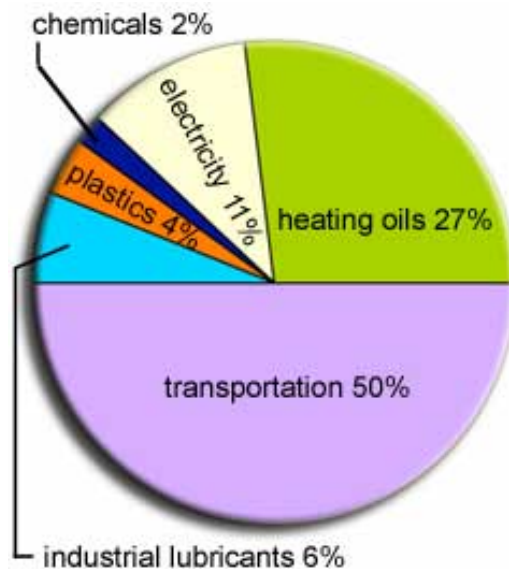
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#### **In the Exxon Valdez incident, how much oil was spilled?**

The largest oil spill to occur in the United States so far was the *Exxon Valdez* spill into Prince William Sound, Alaska, in March 1989. The *Exxon Valdez*, a medium-sized oil tanker, ran aground on a reef to cause this spill of almost 11 million gallons of [crude oil](#). While this was a big spill, it was actually only a small fraction of the oil—less than 2 percent—of what the United States uses in one day!

These big numbers are hard to relate to everyday life, so let's make some comparisons. To better understand how much 11 million gallons of oil is, check the table below. It shows how many familiar rooms or buildings would be filled up by the approximate amount of oil spilled from the *Exxon Valdez*. For example, that much oil would have filled up nine school gyms or 430 classrooms.

Total Volume	Gallons	Gyms	Houses	Classrooms	Living Rooms
<i>Exxon Valdez</i> Oil Spill	10,800,000	>9	108	430	797
School Gymnasium (50' X 50' X 65')	1,274,163	1	13	51	94
Average House (40' X 40' X 8')	100,365	0.1	1	4	7



The worldwide uses of oil resources. (Source: Association of Plastics Manufacturers of Europe)

Average Classroom (20' X 20' X 8')	25,091	0.02	0.25	1	2
Average Living Room (12' X 18' X 8')	13,549	0.01	0.125	0.5	1

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### ***How do oil spills happen?***

Oil spills are caused by accidents involving tankers, barges, pipelines, refineries, and storage facilities, usually while the oil is being transported to us, its users, via rivers, bays, and the ocean. Spills can result from:

- ▶ people making mistakes or being careless.
- ▶ equipment breaking down.
- ▶ natural disasters such as hurricanes.
- ▶ deliberate acts by terrorists, countries at war, vandals, or illegal dumpers.

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### ***What happens after oil hits the water?***

Oil floats on salt water (the ocean) and usually floats on fresh water (rivers and lakes). Very heavy oil can sometimes sink in fresh water, but this happens very rarely. Oil usually spreads out rapidly across the water surface to form a thin layer that is called an [oil slick](#). As the spreading process continues, the layer becomes thinner and thinner, finally becoming a very thin layer called a sheen (or a film), which often looks like a rainbow. (You may have seen sheens on roads or parking lots after a rain.)

Depending on the circumstances, oil spills can be very harmful to [marine](#) birds and mammals, and can harm fish and shellfish. You may have seen dramatic pictures of oiled birds and sea otters that have been affected by oil spills. Oil destroys the insulating ability of fur-bearing mammals, such as sea otters, and the water-repelling abilities of a bird's feathers, thus exposing these creatures to the harsh elements. Many birds and animals also ingest (swallow) oil when they try to clean themselves, which can poison them. Depending on where and when a spill occurs, the number of injured and dead birds and mammals may range from only a few up to hundreds or even thousands.

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### ***Who takes care of the problem?***

Once oil has spilled, any of various local, state, and



Aerial photo of the Valdez Marine Terminal, where crude oil is loaded from the Trans-Alaska pipeline onto tankers for shipment to markets. It was here that oil was loaded onto the *Exxon Valdez* for shipment to Los Angeles. **Click image** for larger view and further details.



The Amoco *Cadiz*, an oil supertanker, sinking off the coast of France in 1978. (Photo credit: OR&R, NOAA)



federal government agencies, as well as volunteer organizations, respond to the incident. They may use any of the following kinds of tools to clean up spilled oil:

- ▶ **booms**, which are floating barriers to oil (for example, a big boom may be placed around a tanker that is leaking oil, to collect the oil).
- ▶ **skimmers**, which are boats that skim spilled oil from the water surface.
- ▶ **sorbents**, which are big sponges used to absorb oil.
- ▶ chemical dispersants and biological agents, which break down the oil into its chemical constituents.
- ▶ in-situ burning, which is a method of burning freshly spilled oil, usually while it's floating on the water.
- ▶ washing oil off beaches with either high-pressure or low-pressure hoses.
- ▶ vacuum trucks, which can vacuum spilled oil off beaches or the water surface.
- ▶ shovels and road equipment, which are sometimes used to pick up oil or move oiled beach sand and gravel down to where they can be cleaned by being tumbled around in the waves.

Which methods and tools oil spill responders choose depends on the circumstances of each event: the weather, the type and amount of oil spilled, how far away from shore the oil has spilled, whether or not people live in the area, what kinds of bird and animal habitats are in the area, and other factors. No two oil spills are the same. Different cleanup methods work on different types of beaches and with different kinds of oil. For example, road equipment works very well on sand beaches, but can't be used in marshes or on beaches with big **boulders** or **cobble**.

Responders also may set up stations where they can clean and rehabilitate wildlife. Sometimes, government agencies or other organizations may decide not to respond at all, because in some cases, responding isn't helpful or even adds to the damage. In the United States, depending on where the spill occurs, either the U.S. Coast Guard or the U.S. Environmental Protection Agency takes charge of the spill response. They, in turn, often call on other agencies, such as NOAA and the U.S. Fish and Wildlife Service, for help and information.

The goal of new federal regulations is to prevent oil spills from happening. People who cause oil spills must pay severe penalties, and the regulations call for safer vessel design in the hopes of avoiding future

During a response, NOAA spill specialists record information about oil slicks in photographs and overflight maps of the area surveyed. This photo, taken during an overflight, shows a streamer, or slick, of brown, emulsified oil, with silver and gray sheen along its edges. **Click image** for larger view and further details.



Workers spray dispersant over spilled oil. Dispersants are chemicals that break oil into small droplets that decompose faster; however, they don't work well if the oil is too **viscous**. Spill response specialists use on-site observations and model predictions to find out when conditions are best for applying dispersants. (Photo credit: OR&R, NOAA)



Volunteers clean a common murre (*Uria aalge*) that was oiled during the *Exxon Valdez* spill. Birds like this one often do not survive oiling, even when they have been cleaned, so it is important to protect them from oiling whenever possible. (Photo credit: OR&R, NOAA)

spills from ships. In the U.S., agencies that respond to oil spills must practice by conducting training drills, and those who manage vessels and facilities that store or transport oil must develop plans explaining how they would respond to a spill, so that they can respond effectively to one if they ever need to.

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### ***Who is ultimately responsible?***

Because oil and oil products in the [environment](#) can cause harm, we need to prevent problems when we can. For example, by avoiding dumping oil or oily waste into the sewer or garbage, we avoid polluting the environment we live in. Sometimes, we can find ways to avoid using oil in the first place: we can bicycle, walk, or take the bus rather than taking a car to some of the places we need to go. When we use less oil, less needs to be transported, and there's a lower risk of future oil spills. We should understand that it is because we rely on oil that we run the risk of oil spills. That means that all of us share both the responsibility for creating the problem of oil spills and the responsibility for finding ways to solve the problem.

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Workers from the National Ocean Service's Office of Response and Restoration clean an oiled, rocky beach with high-pressure, hot-water hoses. (Photo credit: OR&R, NOAA)

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