WATER POLLUTION

**Water pollution** is the contamination of [water](http://en.wikipedia.org/wiki/Water) bodies (e.g. [lakes](http://en.wikipedia.org/wiki/Lake), [rivers](http://en.wikipedia.org/wiki/River), [oceans](http://en.wikipedia.org/wiki/Marine_pollution), [aquifers](http://en.wikipedia.org/wiki/Aquifer) and [groundwater](http://en.wikipedia.org/wiki/Groundwater)). Water pollution occurs when [pollutants](http://en.wikipedia.org/wiki/Pollutant) are directly or indirectly discharged into water bodies without adequate [treatment](http://en.wikipedia.org/wiki/Water_treatment) to remove harmful compounds.

Water pollution affects plants and organisms living in these [bodies of water](http://en.wikipedia.org/wiki/Bodies_of_water). In almost all cases the effect is damaging not only to individual [species](http://en.wikipedia.org/wiki/Species) and populations, but also to the natural [biological communities](http://en.wikipedia.org/wiki/Biocoenosis).

There are also two different ways in which water pollution can occur. If pollution comes from a single location, such as a discharge pipe attached to a factory, it is known as point-source pollution. Other examples of point source pollution include an oil spill from a tanker, a discharge from a smoke stack (factory chimney), or someone pouring oil from their car down a drain. A great deal of water pollution happens not from one single source but from many different scattered sources. This is called nonpoint-source pollution.

**What are the causes of water pollution?**

**Sewage**

With billions of people on the planet, disposing of sewage waste is a major problem. According to [2004 figures](http://www.who.int/mediacentre/news/releases/2004/pr58/en/) from the World Health Organization, some 1.1 billion people (16 percent of the world's population) don't have access to safe drinking water. Sewage disposal affects people's immediate environments and leads to water-related illnesses such as diarrhea that kills 3-4 million children each year. (According to the World Health Organization, water-related diseases could kill 135 million people by 2020.) (When people are sick with viruses, the sewage they produce carries those viruses into the environment. It is possible to catch illnesses such as hepatitis, typhoid, and cholera from river and sea water.

Agricultural Pollution

- Excess fertilizers, pesticides, and insecticides used for agricultural procedures often get discharged in water bodies right from streams to lakes and seas.

Chemical fertilizers used by farmers also add nutrients to the soil, which drain into rivers and seas and add to the fertilizing effect of the sewage. Together, sewage and fertilizers can cause a massive increase in the growth of algae or plankton that overwhelms huge areas of oceans, lakes, or rivers. This is known as a harmful algal bloom (also known as an HAB or red tide, because it can turn the water red). It is harmful because it removes oxygen from the water that kills other forms of life, leading to what is known as a dead zone.

**Industrial waste**

Factories are point sources of water pollution, but quite a lot of water is polluted by ordinary people from nonpoint sources; this is how ordinary water becomes waste water in the first place. Virtually everyone pours chemicals of one sort or another down their drains or toilets. Even [detergents](http://www.explainthatstuff.com/detergents.html) used in [washing machines](http://www.explainthatstuff.com/washingmachine.html) and [dishwashers](http://www.explainthatstuff.com/dishwashers.html) eventually end up in our rivers and oceans. So do the pesticides we use on our gardens. A lot of toxic pollution also enters waste water from highway runoff. Highways are typically covered with a cocktail of toxic chemicals—everything from spilled fuel and [brake](http://www.explainthatstuff.com/brakes.html) fluids to bits of worn tires (themselves made from chemical additives) and exhaust emissions. When it rains, these chemicals wash into drains and rivers. It is not unusual for heavy summer rainstorms to wash toxic chemicals into rivers in such concentrations that they kill large numbers of fish overnight. It has been estimated that, in one year, the highway runoff from a single large city leaks as much oil into our water environment as a typical tanker spill. Some highway runoff runs away into drains; others can pollute groundwater or accumulate in the land next to a road, making it increasingly toxic as the years go by.

**Oil pollution**

When we think of ocean pollution, huge black oil slicks often spring to mind, yet these spectacular accidents represent only a tiny fraction of all the pollution entering our oceans. Even considering oil by itself, tanker spills are not as significant as they might seem: only 12% of the oil that enters the oceans comes from tanker accidents; over 70% of oil pollution at sea comes from routine shipping and from the oil people pour down drains on land.

{ballast water (waste water flushed from [ships](http://www.explainthatstuff.com/how-ships-work.html))}

**How can we stop water pollution?**

**Education**

Making people aware of the problem is the first step to solving it.

**Laws**

One of the biggest problems with water pollution is its transboundary nature. Many rivers cross countries, while seas span whole continents. Pollution discharged by factories in one country with poor environmental standards can cause problems in neighboring nations, even when they have tougher laws and higher standards. Environmental laws can make it tougher for people to pollute, but to be really effective they have to operate across national and international borders.

**Economics**

Most environmental experts agree that the best way to tackle pollution is through something called the polluter pays principle. This means that whoever causes pollution should have to pay to clean it up, one way or another. Polluter pays can operate in all kinds of ways. It could mean that tanker owners should have to take out insurance that covers the cost of oil spill cleanups, for example. It could also mean that shoppers should have to pay for their plastic grocery bags, as is now common in Ireland, to encourage [recycling](http://www.explainthatstuff.com/recycling.html) and minimize waste. Or it could mean that factories that use rivers must have their water inlet pipes downstream of their effluent outflow pipes, so if they cause pollution they themselves are the first people to suffer. Ultimately, the polluter pays principle is designed to deter people from polluting by making it less expensive for them to behave in an environmentally responsible way.

EFFECTS OF WATER POLLUTION

Eutrophication

When a water body is filled with excessive nutrients, often due to surface runoff, it results in dense growth of algae which in turn depletes the oxygen level in the water. This process is called eutrophication. » The dense cover of algae that grows over water as a result of eutrophication reduces the oxygen-carrying capacity of water, thus affecting the aquatic plants and animals. Species, such as trout are unable to survive in dissolved oxygen-deficit waters, thereby leading to their death.

* **Eutrophication** ([Greek](http://en.wikipedia.org/wiki/Greek_language): *eutrophia*—healthy, adequate nutrition, development :is the ecosystem response to the addition of artificial or natural substances, mainly [phosphates](http://en.wikipedia.org/wiki/Phosphate), through [detergents](http://en.wikipedia.org/wiki/Detergent), [fertilizers](http://en.wikipedia.org/wiki/Fertilizer), or [sewage](http://en.wikipedia.org/wiki/Sewage), to an aquatic system.[[1]](http://en.wikipedia.org/wiki/Eutrophication#cite_note-1) One example is the "bloom" or great increase of [phytoplankton](http://en.wikipedia.org/wiki/Phytoplankton) in a water body as a response to increased levels of nutrients. Negative environmental effects include [hypoxia](http://en.wikipedia.org/wiki/Hypoxia_%28environmental%29), the depletion of oxygen in the water, which causes a reduction in specific fish and other animals.
* Increased biomass of [phytoplankton](http://en.wikipedia.org/wiki/Phytoplankton)
* Toxic or inedible phytoplankton species
* Increases in blooms of gelatinous [zooplankton](http://en.wikipedia.org/wiki/Zooplankton)
* Increased [biomass](http://en.wikipedia.org/wiki/Biomass_%28ecology%29) of [benthic](http://en.wikipedia.org/wiki/Benthic) and [epiphytic](http://en.wikipedia.org/wiki/Epiphytic) [algae](http://en.wikipedia.org/wiki/Algae)
* Changes in [macrophyte](http://en.wikipedia.org/wiki/Macrophyte) species composition and biomass
* Decreases in water transparency (increased [turbidity](http://en.wikipedia.org/wiki/Turbidity))
* Colour, smell, and water treatment problems
* [Dissolved oxygen](http://en.wikipedia.org/wiki/Oxygen_saturation) depletion
* Increased incidences of [fish kills](http://en.wikipedia.org/wiki/Fish_kill)
* Loss of desirable fish species
* Reductions in harvestable fish and [shellfish](http://en.wikipedia.org/wiki/Shellfish)

Algal Bloom

An algal bloom or marine bloom or water bloom is a rapid increase in the population of algae in an aquatic system.

Algal blooms may occur in freshwater as well as marine environments.

Typically only one or a few phytoplankton species are involved and some blooms may be recognized by discoloration of the water resulting from the high density of pigmented cells.

Algal bloom concentrations may reach millions of cells per milliliter.

Colors observed are green, yellowish-brown, or red.

Bright green blooms may also occur.

These are a result of blue-green algae, which are actually bacteria (cyanobacteria).

Some algal blooms are the result of an excess of nutrients (particularly phosphorus and nitrogen) into waters and higher concentrations of these nutrients in water cause increased growth of algae and green plants.

As more algae and plants grow, others die.

This dead organic matter becomes food for bacteria that decompose it.

With more food available, the bacteria increase in number and use up the dissolved oxygen in the water.

When the dissolved oxygen content decreases, many fish and aquatic insects cannot survive.

This results in a dead area.

Algal blooms may also be of concern as some species of algae produce neurotoxins.

At the high cell concentrations reached during some blooms, these toxins may have severe biological impacts on wildlife.

Algal blooms composed of phytoplankters known to naturally produce biotoxins are often called Harmful Algal Blooms, or HABs.

The amount of organic wastes that can be degraded by the water bodies is measured in terms of Biological Oxygen Demand (BOD). BOD is the amount of oxygen needed by microorganisms to decompose the organic waste present in the sewage. The higher the amount of BOD, the more water is polluted with organic waste and vice versa. Many people are not aware of the fact that soaps and detergents enrich the water bodies with phosphates. These phosphates often lead to harmful algal bloom (HAB), which is a common problem in stagnant water bodies, such as ponds and lakes. It leads to the suffocation of fish and other organisms in a water body.

When an ecosystem experiences an increase in nutrients, primary producers reap the benefits first. In aquatic ecosystems, species such as algae experience a population increase (called an [algal bloom](http://en.wikipedia.org/wiki/Algal_bloom)). Algal blooms limit the sunlight available to bottom-dwelling organisms and cause wide swings in the amount of dissolved oxygen in the water. Oxygen is required by all aerobically [respiring](http://en.wikipedia.org/wiki/Respiration_%28physiology%29) plants and animals and it is replenished in daylight by [photosynthesizing](http://en.wikipedia.org/wiki/Photosynthesis) plants and algae. Under eutrophic conditions, dissolved oxygen greatly increases during the day, but is greatly reduced after dark by the respiring algae and by microorganisms that feed on the increasing mass of dead algae. When dissolved oxygen levels decline to [hypoxic](http://en.wikipedia.org/wiki/Hypoxia_%28environmental%29) levels, fish and other marine animals suffocate. As a result, creatures such as fish, shrimp, and especially immobile bottom dwellers die off.[[18]](http://en.wikipedia.org/wiki/Eutrophication#cite_note-Horrigan_2002-18) In extreme cases, [anaerobic](http://en.wikipedia.org/wiki/Anaerobic_organism) conditions ensue, promoting growth of bacteria such as [*Clostridium botulinum*](http://en.wikipedia.org/wiki/Clostridium_botulinum) that produces [toxins](http://en.wikipedia.org/wiki/Toxins) deadly to birds and mammals. Zones where this occurs are known as [dead zones](http://en.wikipedia.org/wiki/Dead_zone_%28ecology%29).

**Red tide** is a common name for a phenomenon known as an [algal bloom](http://en.wikipedia.org/wiki/Algal_bloom) (large concentrations of aquatic microorganisms) when it is caused by a few species of [dinoflagellates](http://en.wikipedia.org/wiki/Dinoflagellate) and the bloom takes on a red or brown color. Red tides are events in which estuarine, marine, or fresh water algae accumulate rapidly in the [water column](http://en.wikipedia.org/wiki/Water_column), resulting in coloration of the surface water. It is usually found in coastal areas. It kills many [manatees](http://en.wikipedia.org/wiki/Manatees) every year.[[1]](http://en.wikipedia.org/wiki/Red_tide#cite_note-1)

These algae, known as [phytoplankton](http://en.wikipedia.org/wiki/Phytoplankton), are single-celled protists, plant-like organisms that can form dense, visible patches near the water's surface. Certain species of [phytoplankton](http://en.wikipedia.org/wiki/Phytoplankton), [dinoflagellates](http://en.wikipedia.org/wiki/Dinoflagellate), contain photosynthetic pigments that vary in color from green to brown to red.

When the algae are present in high concentrations, the water appears to be discolored or murky, varying in color from purple to almost pink, normally being red or green. Not all algal blooms are dense enough to cause water discoloration, and not all discolored waters associated with algal blooms are red. Additionally, red tides are not typically associated with tidal movement of water, hence the preference among scientists to use the term algal bloom.

Some red tides are associated with the production of natural toxins, depletion of dissolved oxygen or other harmful effects, and are generally described as [harmful algal blooms](http://en.wikipedia.org/wiki/Harmful_algal_bloom). The most conspicuous effects of these kinds of red tides are the associated wildlife mortalities of marine and coastal species of fish, birds, marine mammals, and other organisms.

Death of aquatic (water) animals

The main problem caused by water pollution is that it kills life that depends on these water bodies. Dead fish, crabs, birds and sea gulls, dolphins, and many other animals often wind up on beaches, killed by pollutants in their habitat (living environment). Oil spills infiltrate into the fur, feathers, and skin of animals and birds, affecting their buoyancy in water. It also hampers their ability to adapt to temperature fluctuations. Excessive exposure to oil can also affect the visibility in animals and birds. Often, it enters the lungs, leading to their death.

Disruption of food-chains

Pollution disrupts the natural [food chain](http://eschooltoday.com/ecosystems/what-is-a-foodchain.html) as well. Pollutants such as lead and cadmium are eaten by tiny animals. Later, these animals are consumed by fish and shellfish, and the food chain continues to be disrupted at all higher levels.

DISEASES

Eventually, humans are affected by this process as well. People can get diseases such as hepatitis by eating seafood that has been poisoned. In many poor nations, there is always outbreak of cholera and diseases as a result of poor drinking water treatment from contaminated waters.It can leads to diarrhea, vomiting, and intestinal problems also.

OIL SPILL

## An oil spill is the release of a liquid petroleum hydrocarbon into the environment, especially the marine ecosystem, due to human activity, and is a form of pollution. The term is usually given to marine oil spills, where oil is released into the ocean or coastal waters, but spills may also occur on land.

## Oil damages wildlife, marine ecosystems, and coastal environments

CLEAN UP OF OIL SPILLS

Cleanup and recovery from an oil spill is difficult and depends upon many factors, including the type of oil spilled, the temperature of the water (affecting evaporation and biodegradation), and the types of shorelines and beaches involved.[[1]](http://en.wikipedia.org/wiki/Oil_spill#cite_note-commondreams1-1)

**1. Using Oil Booms**

Oil booms are a very popular method of controlling oil spills. There are various kinds of oil booms that have been designed for various areas where the oil spillage might occur, leading to a quite thorough oil spill cleanup.

**2. Using Sorbents**

Sorbents mean sponges that are placed on the surface of the spillage affected area. These sorbents suck and absorb the oil from the surface of the water leading to an oil spill cleanup.

**3. Burning In-situ**

In simple terms, this means burning of the oil on the site where the spillage has occurred. The burning has to be done quite promptly before the oil spill can spread to a larger area. But the most important disadvantage of such an on-site burning is that the exhaust that is released contains toxic particles that can cause damage to the oceanic air in addition to the marine life-forms

**4. Using dispensers**

This method involves using fertilizers to disperse the oil spillage in the water. Even though the method sounds and looks unconventional, it is one of the highly recommended oil spill cleanup methods. The fertilizers help to hasten the growth of micro-organisms which help to diffuse the components of the oil spilt in the water.

**5.Skimming**

As the name suggests, skimming involves the removal of the oil spillage with the help of tools and equipments from the surface of the water. The most important aspect to be noted that only lighter oils can be separated and removed from the water in this method of cleaning up oil spills. This is because the density of oil will tend to be lighter than the density of water

**6. Using Hot water and huge force**

In this method, huge force of the hot water is used to push the oil spilt back into the water. Then with the help of the skimming tools and equipments, the oil spill cleanup operation takes place.

**7. Using Manual labour**

People in the coastal areas and beaches can help to accelerate the oil spill cleanup operation. By using simple tools like spades and shovels, removing and isolating the area affected by oil spillage is possible.

**8. Using Technological aid**

By using cranes and tractors, the oil spillage area in beaches and coastal areas can be cleaned.If it is not possible to carry out the oil spill cleanup operation, there itself they can be taken to labs and other equipped areas where the oil spill can be separated from the sand and other items generally found in the beaches and coastal areas.

**9. Using natural methods**

The simplest method of dealing with the oil spill cleanup operation is to make use of the components of nature like the sun, the wind, the weather and the tides. The particles of the oil spill, in due course of time evaporate because of the constancy of these elements. This also forms the most cost-efficient and the slowest method of cleaning up oil spills.

**10.** [**Bioremediation**](http://en.wikipedia.org/wiki/Bioremediation): use of [microorganisms](http://en.wikipedia.org/wiki/Microorganism) or [biological agents](http://en.wikipedia.org/wiki/Biological_agents) to break down or remove oil; such as the bacteria Alcanivorax[[](http://en.wikipedia.org/wiki/Oil_spill#cite_note-kasai-45) or Methylocella Silvestris

**11. Vacuum and** [**centrifuge**](http://en.wikipedia.org/wiki/Centrifuge): oil can be sucked up along with the water, and then a centrifuge can be used to separate the oil from the water - allowing a tanker to be filled with near pure oil. Usually, the water is returned to the sea, making the process more efficient, but allowing small amounts of oil to go back as well. This issue has hampered the use of centrifuges due to a United States regulation limiting the amount of oil in water returned to the sea.