

## Group 1 – Biodegradable Wastes:

Water is made up of hydrogen and oxygen (H<sub>2</sub>O), but may contain many dissolved compounds and gases, such as oxygen. Aquatic organisms like fish, crustaceans and some bacteria use the oxygen to live. The oxygen is dissolved in the water but it does not stay dissolved for very long. The aquatic organisms filter out the oxygen and replace it with carbon dioxide. Water plants use the carbon dioxide that is in the water and replace it with the oxygen used by aquatic organisms.

The delicate cycle of oxygen use and production is often affected by biodegradable wastes. Biodegradable wastes are made by humans and animals. Many cities and towns treat the waste before it enters the water source but there are still some cities and towns that empty their sewage right into their local water source without treating it! Wastes from animals most often enter the water source by run-off. Run-off occurs when heavy rainfalls cause the manure to dissolve in water and the water runs into the water source.

When the biodegradable wastes enter the water supply, they become a food source for aerobic bacteria (oxygen using bacteria). If a large amount of waste is present, then a lot of bacteria can feed on it. The more the bacteria eat, the more they can reproduce. The more they reproduce the more oxygen they use and the less oxygen there is for other forms of aquatic life such as fish and crustaceans. It is possible for the aerobic bacteria to completely use up all the oxygen in the water source causing the fish to suffocate.

Note: Your teacher has not prepared a water sample for this type of pollution.

## Sources:

- [www.safewater.org](http://www.safewater.org)  
<http://www.cartage.org.lb/en/themes/Sciences/Earthscience/Geology/WaterCycles/WaterPollution/Differenttypeswater/Differenttypeswater.htm>  
<http://library.thinkquest.org/C0111040/Types/water.php>  
[http://www.ec.gc.ca/envirozine/english/issues/22/any\\_questions\\_e.cfm](http://www.ec.gc.ca/envirozine/english/issues/22/any_questions_e.cfm)  
<http://www.water-pollution.org.uk/causes.html>

## Group 2 – Nutrient Pollution:

Plants require special nutrients to be healthy and grow strong just like you need vitamins to stay healthy and grow strong. You can get all the vitamins you need from what you eat (broccoli and brussel sprouts included!) but plants get the nutrients they need from the soil. Plants need nitrogen (as nitrates) and phosphorous (as phosphates) to grow. Often, farmers and gardeners will add manure or fertilizers to the soil, which will provide more nutrients for the plants. But sometimes, too much fertilizer and manure is used and the plants can not use up what is in the soil. The extra nutrients are washed into water sources and become pollution.

Most of the nitrates and phosphates in water come from agricultural run-off but industrial waste and some detergents are also sources of these pollutants.

When the nitrates and phosphates enter the water source, a type of water plant called algae goes into buffet mode. Algae grow very quickly in water that has a lot of nitrates and phosphates in it. Eventually that water can become green or blue or red and cloudy from all the algae in it, and it feels slimy and smells bad!

As more algae grow, some of it dies to make room for newer algae. The dead algae decompose and are eaten by bacteria that use up the oxygen in the water. If enough algae have grown in the water and there is enough bacteria eating the algae and using up the oxygen then all the aquatic life in the water can die. This is a process called EUTROPHICATION (u-tro-fi-kay-shun). It is a natural process that normally takes many years to happen depending on temperature, precipitation, and other natural processes but if enough nitrates and phosphates are present, it can occur in less than 50 years.

Note: Your teacher has prepared a water sample for this type of pollution.

### Sources:

– [www.safewater.org](http://www.safewater.org)  
<http://www.cartage.org.lb/en/themes/Sciences/Earthscience/Geology/WaterCycles/WaterPollution/Differenttypeswater/Differenttypeswater.htm>  
<http://library.thinkquest.org/C0111040/Types/water.php>  
[http://www.ec.gc.ca/envirozine/english/issues/22/any\\_questions\\_e.cfm](http://www.ec.gc.ca/envirozine/english/issues/22/any_questions_e.cfm)  
<http://www.water-pollution.org.uk/causes.htm>

### Group 3 – Thermal Pollution:



You might not think that warm water is a source of pollution but it is! When the water temperature begins to get warmer, the amount of oxygen dissolved in the water decreases. When a water source has very little oxygen, it is able to support only a few aquatic organisms.

If you lived in a warm country like the Philippines or Thailand all your life then you would become used to playing, working and sleeping at a certain temperature. If you lived in a place with a lot of breathable air like the Prairies then you would be used to playing, working and sleeping at a certain oxygen level. Imagine that you move from the Philippines to Nunavut. All of a sudden you have to adapt to a temperature change that could kill you. Or imagine that you move from the Prairies to the Himalayas, the decrease in breathable air would make life very hard and if you did not adapt, it could kill you.

The same thing happens to aquatic life when the water gets warmer. Plants, fish and other aquatic life are used to living at a specific temperature and oxygen level. When the water gets warmer, the amount of oxygen dissolved in it decreases. The decrease in oxygen causes plants, fish and other organisms to die.

But what about water that is naturally warm for example hot springs. Well, when was the last time you saw a fish swimming in the Banff Hot springs? The water is too hot for animals, including people, to live in. When water sources warm up, it is usually from industrial waste that is being pumped into the water source while still hot. If enough hot water is added to the water source the temperature of the water will rise.

Note: Your teacher has prepared a water sample for this type of pollution.

#### Sources:

– [www.safewater.org](http://www.safewater.org)

<http://www.cartage.org.lb/en/themes/Sciences/Earthscience/Geology/WaterCycles/WaterPollution/Differenttypeswater/Differenttypeswater.htm>

<http://library.thinkquest.org/C0111040/Types/water.php>

[http://www.ec.gc.ca/envirozine/english/issues/22/any\\_questions\\_e.cfm](http://www.ec.gc.ca/envirozine/english/issues/22/any_questions_e.cfm)

<http://www.water-pollution.org.uk/causes.html>

## Group 4 – Sediment Pollution:



When rain falls in cities, the dirt from the streets washes down into the storm drains and usually empties out into the local water source. Dirt mixes with the water but it eventually settles out of the water and is deposited on the bottom of the river, lake or ocean. The same thing happens on farms when the rain washes soil from the fields into the nearby stream or river. The process of soil or dirt or other suspended particles settling out of water is called sedimentation.

Another danger with sedimentation is that before the suspended particles settle out, the water is cloudy. Cloudy water (or turbid water) absorbs more sunlight than clear water and that absorbed sunlight makes the water warmer, leading to thermal pollution. The cloudy water also blocks the sunlight from reaching the bottom, where plants grow and require sunlight for photosynthesis. Over time, if enough suspended particles are deposited in a water source the bottom of the water source will move closer to the top of the water source. Eventually the water source will fill in.

Note: Your teacher has prepared a water sample for this type of pollution.

### Sources:

– [www.safewater.org](http://www.safewater.org)

<http://www.cartage.org.lb/en/themes/Sciences/Earthscience/Geology/WaterCycles/WaterPollution/Differenttypeswater/Differenttypeswater.htm>

<http://library.thinkquest.org/C0111040/Types/water.php>

[http://www.ec.gc.ca/envirozine/english/issues/22/any\\_questions\\_e.cfm](http://www.ec.gc.ca/envirozine/english/issues/22/any_questions_e.cfm)

<http://www.water-pollution.org.uk/causes.html>

[www.safewater.org](http://www.safewater.org)

## Group 5 – Chemical Pollution:



A wide variety of chemicals are used every day in industry, agriculture and around the home. Everything from cleaning products to pesticides to solvents is used to make products and food or to keep places clean. It might not sound like a type of pollution but think about what is also on the streets and fields. There is oil and gas residue from the vehicles, any fertilizers or pesticides the people have sprayed on their yards, and garbage that people just will not pick up. From fields there can be manure, fertilizers, and pesticides or other chemicals used to control insects and diseases on crops.

Many times, extra chemicals are poured down drains and eventually end up in water sources. For example paints, dyes, and solvents are often poured down drains because people do not know how to dispose of them. These chemicals end up in the water and pollute it. Sometimes, oil is poured down drains. It takes only one drop of oil to pollute 25 L of water!

Occasionally, accidents happen that dump huge amounts of chemicals into water sources. Oil spills can pollute vast amounts of ocean water and are very difficult to clean up. Sometimes flammable chemicals are accidentally released into water systems. In fact, the Cuyahoga River (between the US and Canada) caught fire in 1969 because of the huge amount of flammable chemicals in it!

Landfills and garbage dumps are another major source of chemical pollution in water. When the garbage goes to the dump it is usually buried and after years of sitting under the ground the garbage begins to breakdown. As the garbage breaks down, chemicals are released into the soil and fluid surrounding the garbage. The chemicals, with the help of precipitation and gravity, can move through the soil and eventually end up in the groundwater where they travel with the water, ending up in wells, water treatment plants, and water sources.

Note: Your teacher has prepared a water sample for this type of pollution (use the litmus strip to measure the pH of the polluted water).

### Sources:

- [www.safewater.org](http://www.safewater.org)  
<http://www.cartage.org.lb/en/themes/Sciences/Earthscience/Geology/WaterCycles/WaterPollution/Differenttypeswater/Differenttypeswater.htm>  
<http://library.thinkquest.org/C0111040/Types/water.php>  
[http://www.ec.gc.ca/envirozine/english/issues/22/any\\_questions\\_e.cfm](http://www.ec.gc.ca/envirozine/english/issues/22/any_questions_e.cfm)  
<http://www.water-pollution.org.uk/causes.html>



## Group 6 – Radioactive Pollution:

When people think about radioactive pollution they may recall disasters like Chernobyl, in the Ukraine, when the nuclear energy reactor malfunctioned and released radioactive material into the air and the water system. This accident resulted in many deaths, either directly from the malfunction or as a result of cancer caused by exposure to the radioactive material.

On July 15, 2007 an earthquake in Japan damaged a nuclear power plant and released an undocumented amount of radioactive pollution into the Sea of Japan.

It is true that some radioactive pollutants can come from nuclear power factories. But uranium mines are also a source of radioactive pollutants.

There are also some naturally occurring radioactive pollutants (or NORMs), such as radon. But the amount of naturally occurring radioactive pollutants are small and are not a cause for concern. However, when these NORMs are disturbed by digging, mining or oil and gas production they can enter the water in greater amounts and become a serious concern.

Under circumstances of heavy radioactive pollution, it is common to see birth defects in both human and animal populations. There is also an increase in the number of tumors and cancer incidents.

Note: Your teacher has not prepared a water sample for this type of pollution.

## Sources:

– [www.safewater.org](http://www.safewater.org)

<http://www.cartage.org.lb/en/themes/Sciences/Earthscience/Geology/WaterCycles/WaterPollution/Differenttypeswater/Differenttypeswater.htm>

<http://library.thinkquest.org/C0111040/Types/water.php>

[http://www.ec.gc.ca/envirozine/english/issues/22/any\\_questions\\_e.cfm](http://www.ec.gc.ca/envirozine/english/issues/22/any_questions_e.cfm)

<http://www.water-pollution.org.uk/causes.html>

[www.safewater.org](http://www.safewater.org)

## Group 7 – Medicinal Pollution:



There is recent research that suggests water sources are being contaminated with medicine. People commonly flush unused or expired medicine down the drain, and it enters a water source. If you take medicine for a cold or antibiotics for an infection, whatever your body does not use is flushed away with other wastes and enters the water source. Water treatment plants are not equipped to deal with medicine in water systems and the pills or syrups have often dissolved by the time the water reaches the treatment plant. Medicines like antibiotics, acetaminophen and human hormones are commonly found both in water sources and treated water.

The consequences of this type of pollution are not entirely known yet. There is some documented research showing decreases in fish fertility and therefore a decrease in fish populations. Many of the drugs and chemicals that are polluting water sources are called hormone disrupters. Hormone disrupters contain synthetic hormones (either estrogen or androgen). Currently, the estrogen in many products is interfering with the natural hormonal processes in male fish.

There is also the greater prevalence of “super bugs” or bacteria that are resistant to most antibiotics. The health and environmental effects of medicinal pollution are still being investigated.

Note: Your teacher has prepared a water sample for this type of pollution.

### Sources:

– [www.safewater.org](http://www.safewater.org)

<http://www.cartage.org.lb/en/themes/Sciences/Earthscience/Geology/WaterCycles/WaterPollution/Differenttypeswater/Differenttypeswater.htm>

<http://library.thinkquest.org/C0111040/Types/water.php>

[http://www.ec.gc.ca/envirozine/english/issues/22/any\\_questions\\_e.cfm](http://www.ec.gc.ca/envirozine/english/issues/22/any_questions_e.cfm)

<http://www.water-pollution.org.uk/causes.html>

## Group 8 – Microbiological Pollution:

The presence of bacteria, viruses and protozoa in water can be considered a type of water pollution because without proper treatment, the water is unusable.

These organisms are known to cause a variety of health problems from cholera to polio. Proper testing and treatment of the water can render these organisms inactive. But when they go unnoticed, they cause very serious illness in humans, fish and crustaceans.

*Cryptosporidium*, for example, is a protozoan parasite that can cause minor stomach aches and diarrhea, but it can also be responsible for severe dehydration and even death. In 2003, *Cryptosporidium* was found in the drinking water in North Battleford, Saskatchewan. The parasite caused over 7,000 people to become ill. In 1993, *Cryptosporidium* was responsible for a large outbreak of cryptosporidiosis in Milwaukee, Wisconsin. About 403,000 people became ill (there were about 880,000 people who were served by the water treatment plant), and more than 100 people died as a result!

In regions where there is little access to clean drinking water and adequate sanitation, epidemics are typically spread by waterborne pathogens. It is estimated that about 80 percent of diseases in developing countries are water-related!

Note: Your teacher has not prepared a water sample for this type of pollution.

### Sources:

- [www.safewater.org](http://www.safewater.org)

<http://www.cartage.org.lb/en/themes/Sciences/Earthscience/Geology/WaterCycles/WaterPollution/Differenttypeswater/Differenttypeswater.htm>

<http://library.thinkquest.org/C0111040/Types/water.php>

[http://www.ec.gc.ca/envirozine/english/issues/22/any\\_questions\\_e.cfm](http://www.ec.gc.ca/envirozine/english/issues/22/any_questions_e.cfm)

<http://www.water-pollution.org.uk/causes.html>