



There are many forms of acid rain that are seen around the world. In parts of the world where there is wet weather, there is acid rain, acid snow, and acid fog. In parts of the world where there is dry weather, there is acid gas and acid dust. All of the lakes and streams in the world are normally slightly acidic. Heavy rainstorms or melting snow can cause the acidity in lakes and in streams to increase.

What effect does acid rain have on sea life?

Acid rain is very harmful to the environment. Acid rain damages everything over a period of time because it makes the living things in the environment die. Acid rain affects the life in the water as well as the life on land. It is almost worse in water than on land because the fish that are in the water need the water to breathe. When the water gets polluted, then the fish get sick and end up dying.

All rainwater contains some level of acidity. Acidity is measured by pH, which stands for potential of hydrogen. The pH scale measures the amount of acid in a substance. PH is measured on a scale from 0-14, with 7 being neutral. The lower the number is on the pH scale, the more acidic that substance is. Normal rainwater has a pH of 5.6. When the pH level of rainwater goes below 5.6, it is considered acid rain.

All of the sea life will die when the water that they swim in gets to be too acidic. For example, all fish will die when the water goes below a pH of 4.5. Most of the frogs and insects that live around the water will also die when the water reaches a pH of 4.5. With a pH of 5.5, all of the bottom-dwelling bacterial decomposers, animals that eat the remains of the food that other animals don't want, will begin to die. When these decomposers die, they leave the un-decomposed food on the bottom of the water. This pollutes the water by making the water dirty for all of the fish to swim in. All fresh water shrimp die when there gets to be a pH of 6.0. Aquatic plants will grow the best when the water is a pH between 7.0 and 9.2. If acid rain gets to be more of a problem, then all of the sea life will eventually be gone.

Some of the lakes that were once acidic are recovering, but many more are not recovering. Of the 202 lakes that were chosen to be studied in the early 1980s; only 33% of them have become less acidic.

What effect does acid rain have on the forests of the world?

Trees are also harmed by acid rain. In Germany, the forests are believed to be dying because acid rain is harming them. Scientists say that acid rain damages the waxy outer coating that protects the leaves. When this happens, it allows the acid to seep into the tree. Instead of water changing from a liquid to a gas inside the leaves, gas is taking the place of the water. This prevents the plant from taking in carbon dioxide to perform photosynthesis, and the plant will eventually die.

Acid rain, acid fog, and acid vapor also damage forests by damaging the surface of the leaves and needles. This makes it harder for the trees to withstand the cold and

will cause the tree to die. Acid rain also harms the soil that the trees are growing in by taking most of the valuable nutrients away from the soil. Acid rain also leaves a lot of aluminium in the soil, which can be harmful to the trees that grow there.

The atmosphere deposits a lot of toxic metals into the forests because acid rain contains metal. Some of these metals are lead, zinc, copper, chromium, and aluminium. When there is acid rain, the rain releases these metals. This is believed to stunt the growth of many trees and plants. This also stunts the growth of mosses, algae, nitrogen-fixing bacteria, and fungi that are needed to help the forest grow. Forests need these because they eat the harmful things that will kill the trees, such as bad bacteria. Acid rain hurts trees because they cannot grow any more.

What effect does acid rain have on the air, us, and our health?

Acid rain affects us in many different ways. One major way is our health. Breathing and lung problems in children and adults who have asthma and in children have been linked to acid air pollution. Everything that we eat, drink, and breathe has at one time come in contact with acid deposits. This could threaten our health by making us become sick. The following health problems occur each year in the U.S. and Canada due to acid rain:

- 📊 550 premature deaths
- 📊 1,520 emergency room visits
- 📊 210,070 asthma symptom days

As you see, if acid rain became a little less of a problem, then there would be many health problems that could be avoided.

What can acid rain do to non-living things?

Acid rain can also damage non-living things, such as buildings and statues. It can decay building materials and paints. Worst of all, it can damage non-replaceable buildings, statues, and sculptures that are part of our nation's memories that we want to last for a very long time.

What is acid rain caused by?

Acid rain is mainly caused by these substances that are being released into the air:

- 📊 Carbon dioxide: Carbon dioxide is released by burning coal, oil, and natural gas. If you inhale carbon dioxide, then since it is toxic, it can cause you to have to breathe more than usual, unconsciousness, and other serious health problems.
- 📊 Carbon monoxide: Carbon monoxide is released by burning gasoline, oil, and wood. When carbon monoxide enters your body, it goes into the bloodstream. When this happens, it will slow down the delivery of oxygen

to the rest of the body, causing dizziness, headaches, and fatigue.

- ③ Chlorofluorocarbons (CFCs): CFCs are the chemicals that are used in industry, refrigeration, air conditioning systems, and consumer products. Whenever CFCs are released into the air, they reduce the stratospheric ozone layer. The stratospheric ozone layer protects Earth's surface from the harmful rays of the sun.
- ③ Hazardous air pollutants (HAPS): HAPS are released into the air by sources such as chemical plants, dry cleaners, printing plants, and motor vehicles (cars, trucks, buses, and planes). HAPS can cause serious health problems like cancer, birth defects, nervous system problems, and deaths that are all due to people accidentally letting them go into the air.
- ③ Lead: Lead is released by house and car paint as well as the manufacturing of lead batteries, fishing lures, certain parts of bullets, some ceramic ware, water pipes, and fixtures. In young children, lead can cause nervous system damage and learning problems.
- ③ Nitrogen oxides: Nitrogen Oxides are released into the air by burning fuels such as gasoline and coal. When nitrogen oxides combine with VOCs, they can cause breathing difficulty in people who have asthma, coughs in children, and general illness in your respiratory system.
- ③ Ozone: Ozone is released by motor vehicles, industries, burning coal, gasoline, and other fossil fuels, and in the chemicals that are in hairspray and paints. When ozone is close to the ground (ground level ozone) it can cause chest pain, irritated respiratory tract, or persistent cough, can make you unable to take deep breaths, and can make you more likely to get lung infections.
- ③ Particulate matter (PM): PM, little particles of pollution, is released by cars, trucks, and buses that are burning diesel fuel, fertilizers, pesticides, road construction, steel making, mining, and turning on fire places and wood stoves. When PMs mix with air particles and get breathed in by something, they get stuck in the lung tissue. There they can cause increased respiratory disease and lung damage.
- ③ Sulphur dioxides: Sulphur dioxides are released by burning coal, paper production, and melting metal. Sulphur dioxide can harm vegetation, harm metals, and cause lung problems, which include breathing problems and permanent lung damage.
- ③ Volatile organic compounds (VOCs): VOCs are released into the air by burning gasoline, wood, coal, or natural gas, solvents, paints, glues, and other products that are used at work or at home.

There are a lot of similarities in all of these pollutants. Most of the pollutants are from motor vehicles. Motor Vehicles release harmful smoke into the air, which causes acid rain. Coal, oil, and gasoline are also some of the most common causes of all of the pollutants. If people reduce the amount of these things that they release into the air, then there will be less pollutants. Some of the most common health problems are breathing problems, nervous system problems, and lung problems.

Air Pollutant	% that mobile sources contribute to acid rain	% that other sources contribute to acid rain
Volatile organic compound	37%	63%
Nitrogen oxide	49%	51%
Carbon monoxide	81%	19%
Particulate matter	27%	73%

The table above shows that the biggest air pollutant that mobile sources contribute to acid rain is carbon monoxide. Of all of the carbon monoxide releases that contribute to acid rain, 81% of them come from mobile sources. The biggest other source is particulate matter, little particles of pollution that are released into the air by cars, trucks, and buses that are burning diesel fuel, fertilizers, pesticides, road construction, steel making, mining, and turning on fire places and wood stoves. 73% of the non-mobile sources that contribute to acid rain are caused by the release of particulate matter. The table above shows how much mobile and other sources of pollution can make acid rain more of a problem. Seeing that carbon monoxide and particulate matter are the leading sources of pollution, by cutting down on these, acid rain will not be as much of a problem.

What can you do?

There are many ways that people can stop pollution. One major way is to reduce the amount of trips that you take in your car. Another way that a lot of our pollution is caused is by creating electrical energy. When electricity is created, fuels are usually burned, and this causes the pollution, which causes acid rain. The generation of electric power produces more pollution than any other industry in the United States. Burning coal and other fossil fuels causes most of our pollution. This is why in some places around the world, acid rain is monitored very closely. In 1998, data shows that by using electricity, the pollution that comes with it was responsible for 67% of the sulphur dioxide emissions that caused acid rain that year. Every time that you turn on the lights, that causes the pollution that causes acid rain. Even doing little things that you may think don't cause pollution sometimes really do.

Adapted from http://library.thinkquest.org/CR0215471/acid_rain.htm