

Acid Rain

Acid rain is a serious environmental problem that affects large parts of the US and Canada. This section of the Web site provides information about acid rain's causes and effects, how we measure acid rain, and what is being done to solve the problem.

- [What is acid rain and what causes it?](#)
- [How do we measure acid rain?](#)
- [What are acid rain's effects?](#)
- [How do we reduce acid rain?](#)
- [Science Experiments](#)
- [Learning Activities](#)
- [Glossary](#)

- [Acid Rain Program Progress Report](#)

- [Nitrogen: Multiple and Regional Impacts](#)

- [Lesson plans for K-12 from the Texas Natural Resource Conservation Commission](#)



Note: If you're looking for the Student Sourcebook, you've found it! We've combined it with other materials, updated and expanded the information, and reformatted it to cover a broader range of topics.. This page links to all of the information in the original Sourcebook; in many cases, it uses the same text as the Sourcebook.

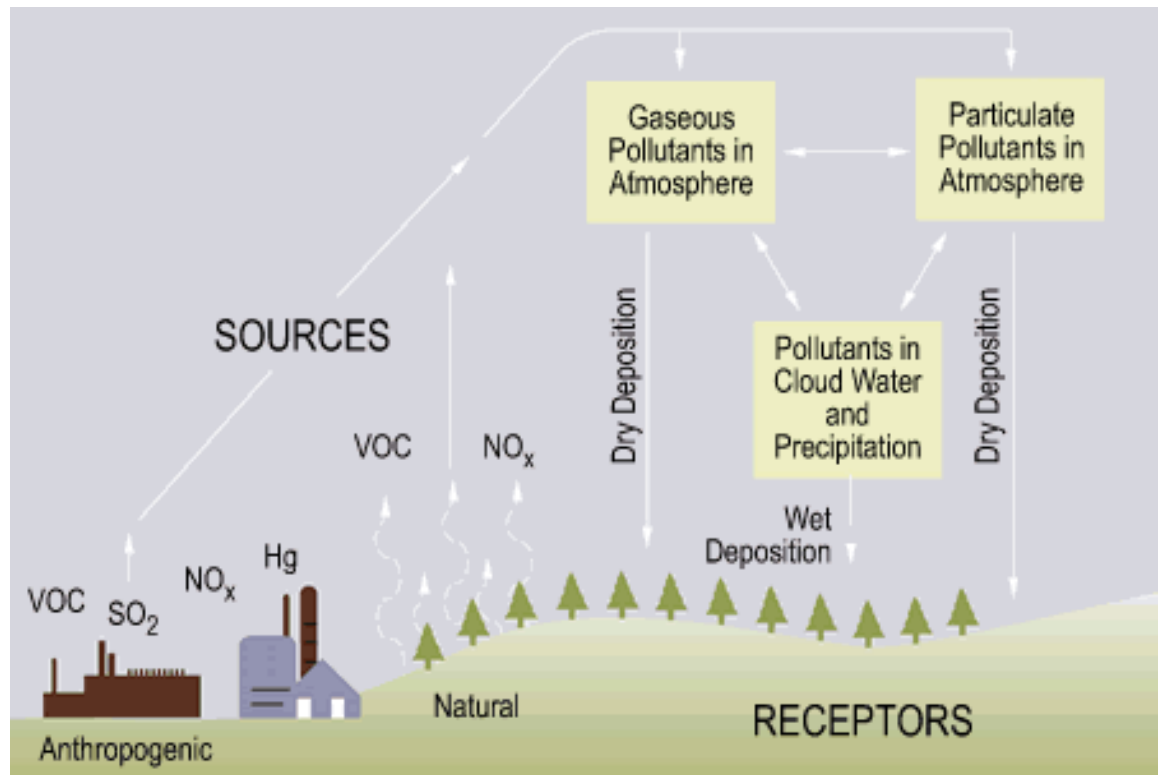
What is Acid Rain and What Causes It?

"Acid rain" is a broad term used to describe several ways that acids fall out of the atmosphere. A more precise term is acid deposition, which has two parts: wet and dry.

Wet deposition refers to acidic rain, fog, and snow. As this acidic water flows over and through the ground, it affects a variety of plants and animals. The strength of the effects depend on many factors, including how acidic the water is, the chemistry and [buffering capacity](#) of the soils involved, and the types of fish, trees, and other living things that rely on the water.

Dry deposition refers to acidic gases and particles. About half of the acidity in the atmosphere falls back to earth through dry deposition. The wind blows these acidic particles and gases onto buildings, cars, homes, and trees. Dry deposited gases and particles can also be washed from trees and other surfaces by rainstorms. When that happens, the runoff water adds those acids to the acid rain, making the combination more acidic than the falling rain alone.

Prevailing winds blow the compounds that cause both wet and dry acid deposition across state and national borders, and sometimes over hundreds of miles.



Scientists discovered, and have confirmed, that sulfur dioxide (SO₂) and nitrogen oxides (NO_x) are the primary causes of acid rain. In the US, About 2/3 of all SO₂ and 1/4 of all NO_x comes from electric power generation that relies on burning fossil fuels like coal.


Acid rain occurs when these gases react in the atmosphere with water, oxygen, and other chemicals to form various acidic compounds. Sunlight increases the rate of most of these reactions. The result is a mild solution of sulfuric acid and nitric acid.

How Do We Measure Acid Rain?

Acid rain is measured using a scale called "pH." The lower a substance's pH, the more acidic it is. See the [pH page](#) for more information.

Pure water has a pH of 7.0. Normal rain is slightly acidic because carbon dioxide dissolves into it, so it has a pH of about 5.5. As of the year 2000, the most acidic rain falling in the US has a pH of about 4.3.

Acid rain's pH, and the chemicals that cause acid rain, are monitored by two networks, both supported by EPA. The National Atmospheric Deposition Program measures wet

deposition, and its [Web site](#)  features maps of rainfall pH (follow the link to the isopleth maps) and other important precipitation chemistry measurements.

The Clean Air Status and Trends Network (CASTNET) measures dry deposition. Its [Web site](#) features information about the data it collects, the measuring sites, and the kinds of equipment it uses.

What Are Acid Rain's Effects?

Acid deposition has a variety of effects, including damage to forests and soils, fish and other living things, materials, and human health. Acid rain also reduces how far and how clearly we can see through the air, an effect called visibility reduction. The [acid rain effects section](#) provides more details on each of these.

How Do We Reduce Acid Rain?

- [What society can do](#)
 - [What individuals can do](#)
 - What EPA is doing
EPA's [Acid Rain Program](#) limits, or "caps," sulfur dioxide (SO₂) emissions from power plants at 8.95 million tons annually, allows those plants to trade SO₂ allowances, and reduces nitrogen oxide emission rates.
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Experiments & Activities for Students

The [experiments page](#) provides detailed instructions and suggestions for classroom activities.

Glossary

The Clean Air Market Programs [glossary](#) includes many terms related to acid rain.

[Air Markets Home](#)

[Contact Us](#)

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[Other Air Issues](#)

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<http://www.epa.gov/airmarkets/acidrain/index.html>