

SWS-Acid Rain

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CONCEPT

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SWS-Acid Rain

- Explain how acid rain forms.
- Describe the consequences of acid rain.

Acid Rain Overview



What would the artists think?

Notre Dame Cathedral in Paris opened in 1345. Construction took almost 200 years. For about 500 years, the cathedral was pristine. Yet this gargoyle has pits in it. The pits are caused by acid rain. Acid rain forms from pollutants from fossil fuel burning.

Acid Rain

Acid rain is rain that has a pH less than 5 (**Figure 1.1**). Acidity is measured on the **pH scale**. Lower numbers are more acidic, and higher numbers are less acidic (also called more **alkaline**). An **acid** has a pH of less than 7. The pH of normal rain is 5.6. It's slightly acidic because carbon dioxide in the air dissolves in rain. This forms carbonic acid, a weak acid.

How Acid Rain Forms

Acid rain forms when nitrogen and sulfur oxides in air dissolve in rain (**Figure 1.2**). This forms nitric and sulfuric acids. Both are strong acids. Acid rain with a pH as low as 4.0 is now common in many areas. Acid fog may be even more acidic than acid rain. Fog with a pH as low as 1.7 has been recorded. That's the same pH as toilet bowl cleaner!

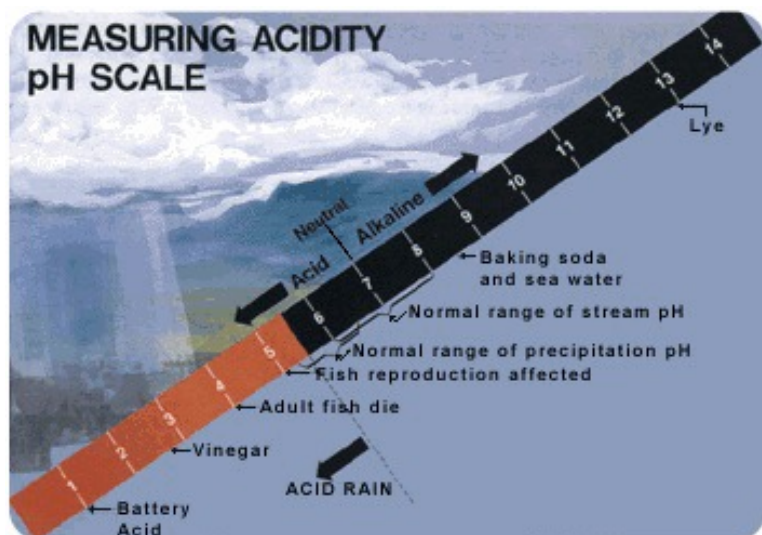


FIGURE 1.1

This pH scale includes both normal and acid rain. At what pH do fish have problems reproducing?

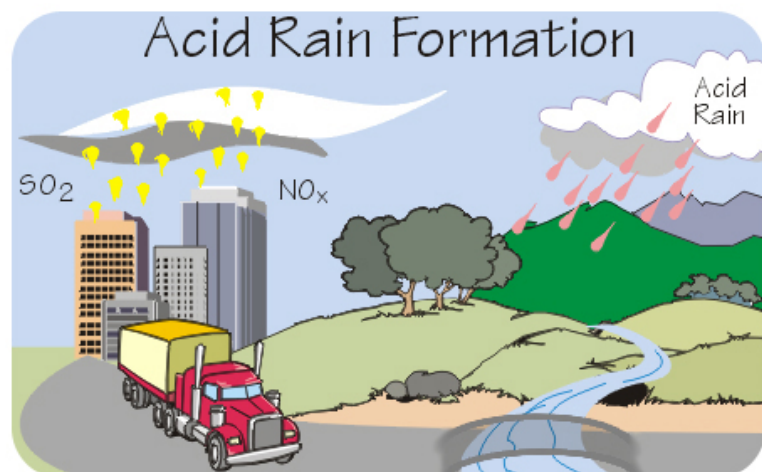


FIGURE 1.2

Nitrogen and sulfur oxides combine with rain to form acid rain.

Effects of Acid Rain

The image below shows some of the damage done by acid rain (**Figure** below). Acid rain ends up in soil and bodies of water. This can make them very acidic. The acid strips soil of its nutrients. These changes can kill trees, fish, and other living things. Acid rain also dissolves limestone and marble. This can damage buildings, monuments, and statues.

Digging Deeper

Use the resources below to answer the questions that follow.

- Coal Combustion and Acid Rain at http://www.youtube.com/watch?feature=player_embedded&v=HE6Y0iEuXMQ (2:04)



MEDIA

Click image to the left for more content.

Acid Rain Overview from USGS:**Effects of Acid Rain on the Ecosystem from National Geographic:****Acid Rain Student Site from the EPA:****Review Questions:**

1. What is acid rain? How is it different from "regular precipitation"?
2. What causes acid rain? What two gases react with water to make acid rain?
3. Where does much of the acid rain fall? Where does acid rain do the most damage?
4. What damage does acid rain do to ecosystems/organisms?
5. What damage does it do to structures/monuments?
6. How can we reduce acid rain? How effective are these methods?
7. How does pH affect the natural world and environment?
8. How does pH affect your daily life and actions?

References

1. Courtesy of the US Geological Survey. . Public Domain
2. Courtesy of the U.S. EPA. . Public Domain