ACID PRECIPITATION!! (Arghhhhhhh)

OK...so it really isn’t THIS dramatic

BUT...it’s still a problem!!
What is Acid Precipitation?

- Acid precipitation is precipitation that is lower than normal.
- Neutral, pure water has a pH of 7
- Most normal precipitation has a pH around 5.6
- Acid precipitation is usually lower than a pH of 5.6
Types of Acid Precipitation

• Acid precipitation might also be called acid deposition.
  
  – Wet deposition:
    • Occurs within 4-14 days after pollution of acid deposition causing chemicals
    • Examples: Rain, Fog, Sleet, Snow
  
  – Dry deposition
    • In areas that are dry, acid chemicals may become incorporated into dust or smoke and fall to the ground as a particle.
    • Occurs within 2-3 days after the pollution of acid deposition causing chemicals
    • Examples: Acid particulate matter

• About half of acid deposition is wet and half is dry.
Main Causes of Acid Precipitation

• Some acid precipitation is natural (small amount)
  – Volcanoes release gases that can create acid precipitation

• Humans pollute the environment with gases that can create acid precipitation. Those gases are:
  – $\text{SO}_2$
  – $\text{NO}_x$
How is Acid Rain Formed?

- SO$_2$ and NO$_x$ are emitted into the air
- Combine with water in clouds to create sulfuric acid (H$_2$SO$_4$) and nitric acid (HNO$_3$)
- pH of wet precipitation is lowered
Where is it the worse?

- Acid rain damage gets worse as you move east of the pollutant (since winds carry east).
  - China has worst acid deposition due to coal usage.
  - East coast is worst in the U.S.
- Limestone (CaCO$_3$) based soils have less of a problem, since the lime neutralizes the acid
- Mountain top areas also most prone – due to acid fog exposure
Effects of Acid Rain

• 1) Acid rain washes away nutrients from the soil for vegetation
   – Acid rain washes away nutrients of calcium and magnesium, making it hard for trees to thrive

• 2) Acid rain makes aluminum free from soil for plants to assimilate.
   – Aluminum is bad for plants, as it blocks water uptake.
Effects of Acid Rain

3) Lower pH in lakes and rivers affects aquatic life
   - Many species of fish and other organisms cannot survive in low pH water
   - Acid Shock -- When acid snow melts at once in the spring, all the acid goes into lakes/rivers at once.
   - Increased aluminum might be toxic to organisms
Effects of Acid Rain

• 4) Acid rain dissolves away buildings and sculptures over time.
  – Dissolve limestone, marble, and concrete
  – Greek ruins, Egyptian pyramids, and the Lincoln Memorial have all been affected.
Effects of Acid Rain

• 5) Human health
  – Dry deposition (acid particulates) burn and irritate the lungs
    • Might aggravate asthma
    • Could create breathing difficulties
  – Additional aluminum freed up in the environment could be consumed by humans (not sure though how it may affect human health directly – not a proven issue in human health)
What do you do?

• Reduce emissions of NOx and SO2
• Reduce coal use (high content of sulfur!)
• Create regional pollution plans rather than local pollution plans
• Add lime (calcium carbonate) to lakes
• Add phosphate detergent to neutralize lakes