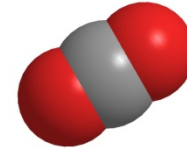
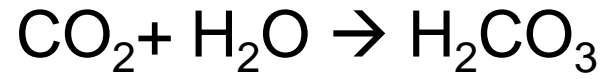
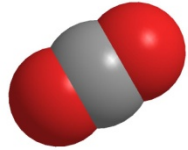


# Acidic Precipitation



Scourge from the Skies

# A. Why Even “Clean Rain” has $\text{pH} < 7$



# B. What is Acidic Precipitation?

It's rain that has been contaminated with the following two acids:

- $\text{pH} < 5.6$



- $\text{HNO}_3$

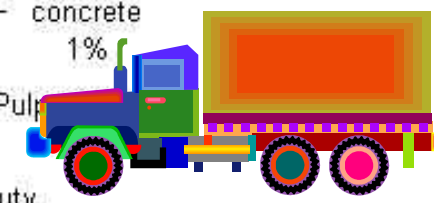
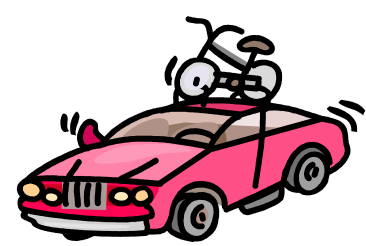
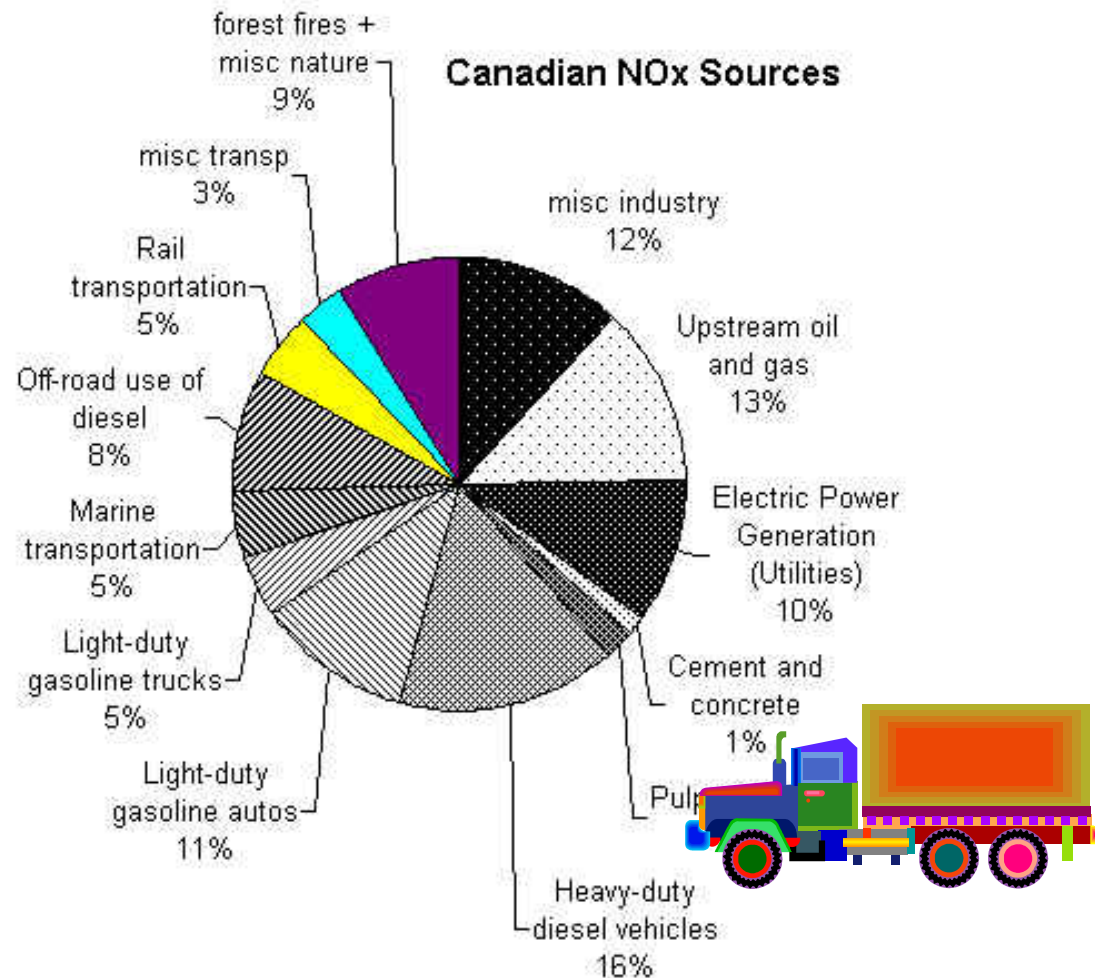
- Nitric acid

- $\text{H}_2\text{SO}_4$

- Sulfuric acid

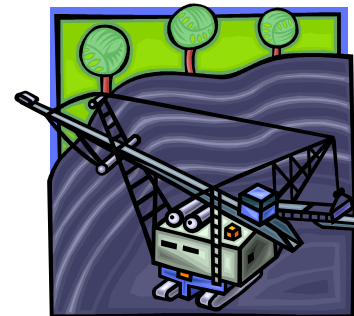
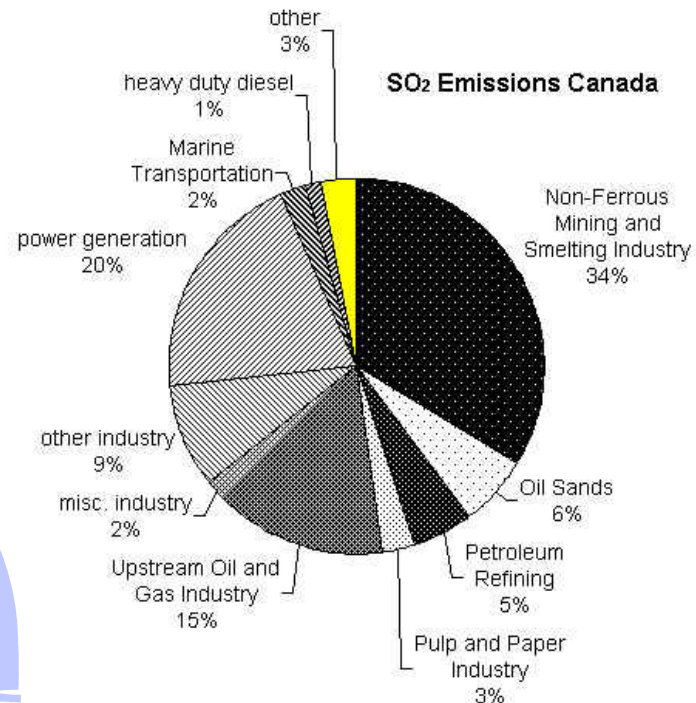
# C. What Atmospheric Contaminants lead to Acidic Precipitation?

## 1) $\text{NO}_2$ from transportation, industry & utilities



## C. What Atmospheric Contaminants lead to Acidic Precipitation?

- 2)  $\text{SO}_2$  from burning sulfur-containing fuels like coal, especially, and diesel
- 3)  $\text{SO}_2$  from refining metal ores





## C. What Causes Acidic Precipitation? (continued)

The gases then react with hydroxyl in the air to produce acids.



D. What activities release these contaminants into the atmosphere?

Transportation, electricity generation or heating with fossil fuels, metal refining

One Brick Shy

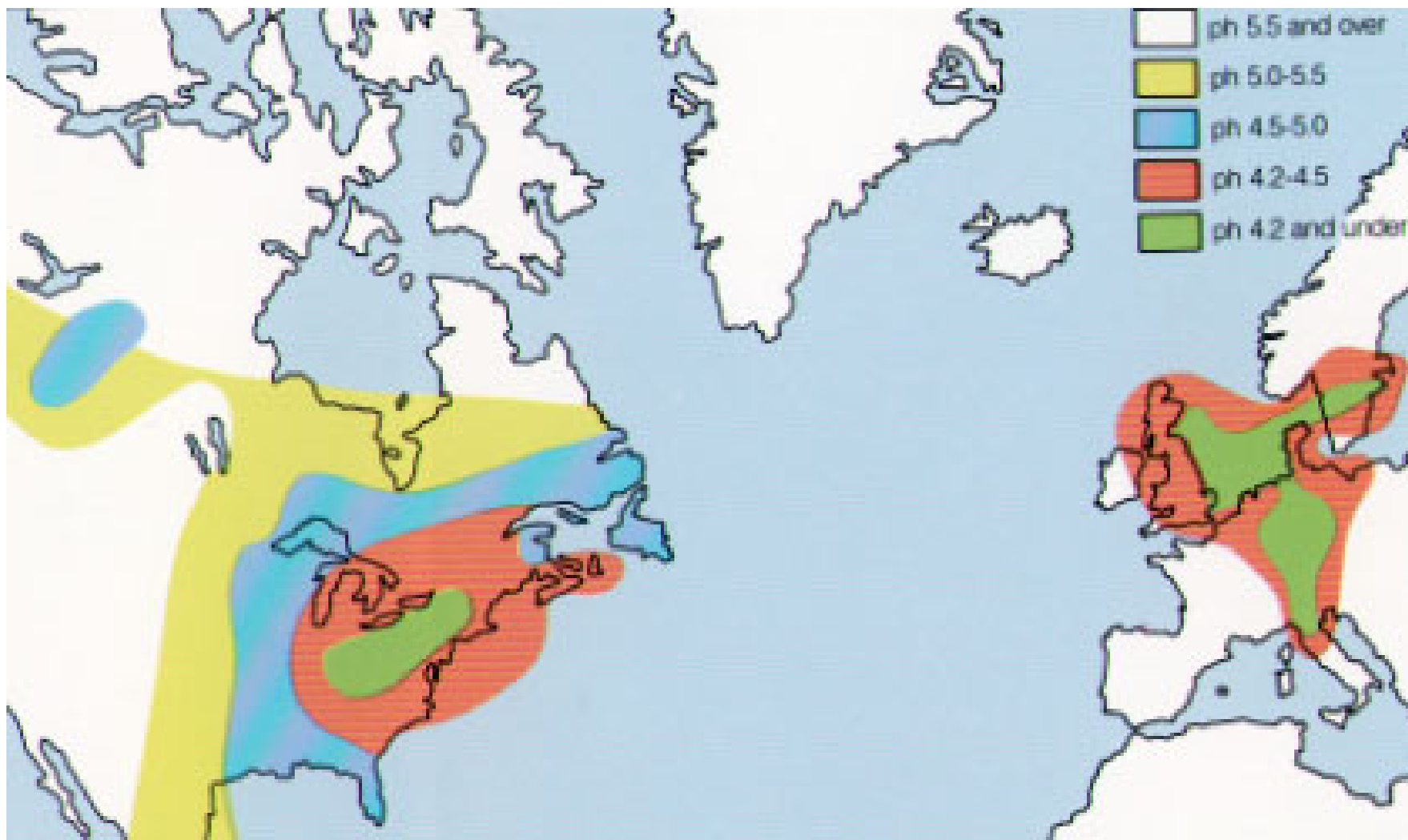


"Dad, what's acid rain?"

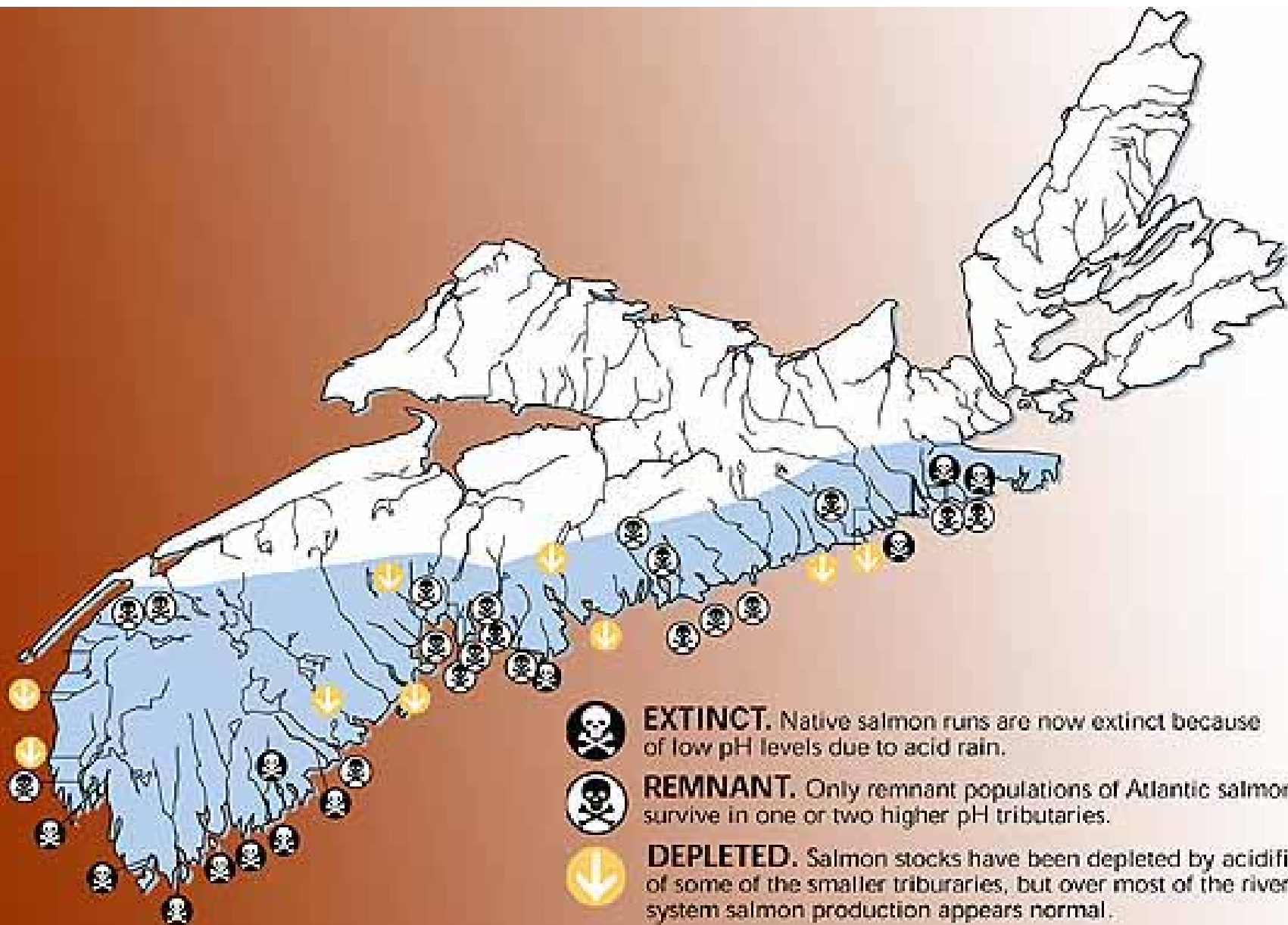
# E. Impact on Health and Environment

- **As water pH approaches 6.0**
- crustaceans, insects, and some plankton species begin to disappear.
- **5.0**
- major changes in the makeup of the plankton community occur.
- less desirable species of mosses and plankton may begin to invade.
- the progressive loss of some fish populations is likely, with the more highly valued species being generally the least tolerant of acidity.
- **Less than 5.0**
- the water is largely devoid of fish.
- the bottom is covered with undecayed material.
- the nearshore areas may be dominated by mosses.
- terrestrial animals, dependent on aquatic ecosystems, are affected.









**EXTINCT.** Native salmon runs are now extinct because of low pH levels due to acid rain.



**REMNANT.** Only remnant populations of Atlantic salmon survive in one or two higher pH tributaries.



**DEPLETED.** Salmon stocks have been depleted by acidification of some of the smaller tributaries, but over most of the river system salmon production appears normal.

## E. Impact on Health and Environment(continued)



- **What does acid rain do to trees?**
- Acid rain, acid fog and acid vapour damage the surfaces of leaves and needles, reduce a tree's ability to withstand cold, and inhibit plant germination and reproduction. Consequently, tree vitality and regenerative capability are reduced.
- Prolonged exposure to acid rain causes forest soils to lose valuable nutrients. It also increases the concentration of aluminum in the soil, which interferes with the uptake of nutrients by the trees.





## E. Impact on Health and Environment(continued)

- Aggravates respiratory diseases such as asthma, bronchitis, pneumonia and emphysema



## E. Impact on Health and Environment(continued)



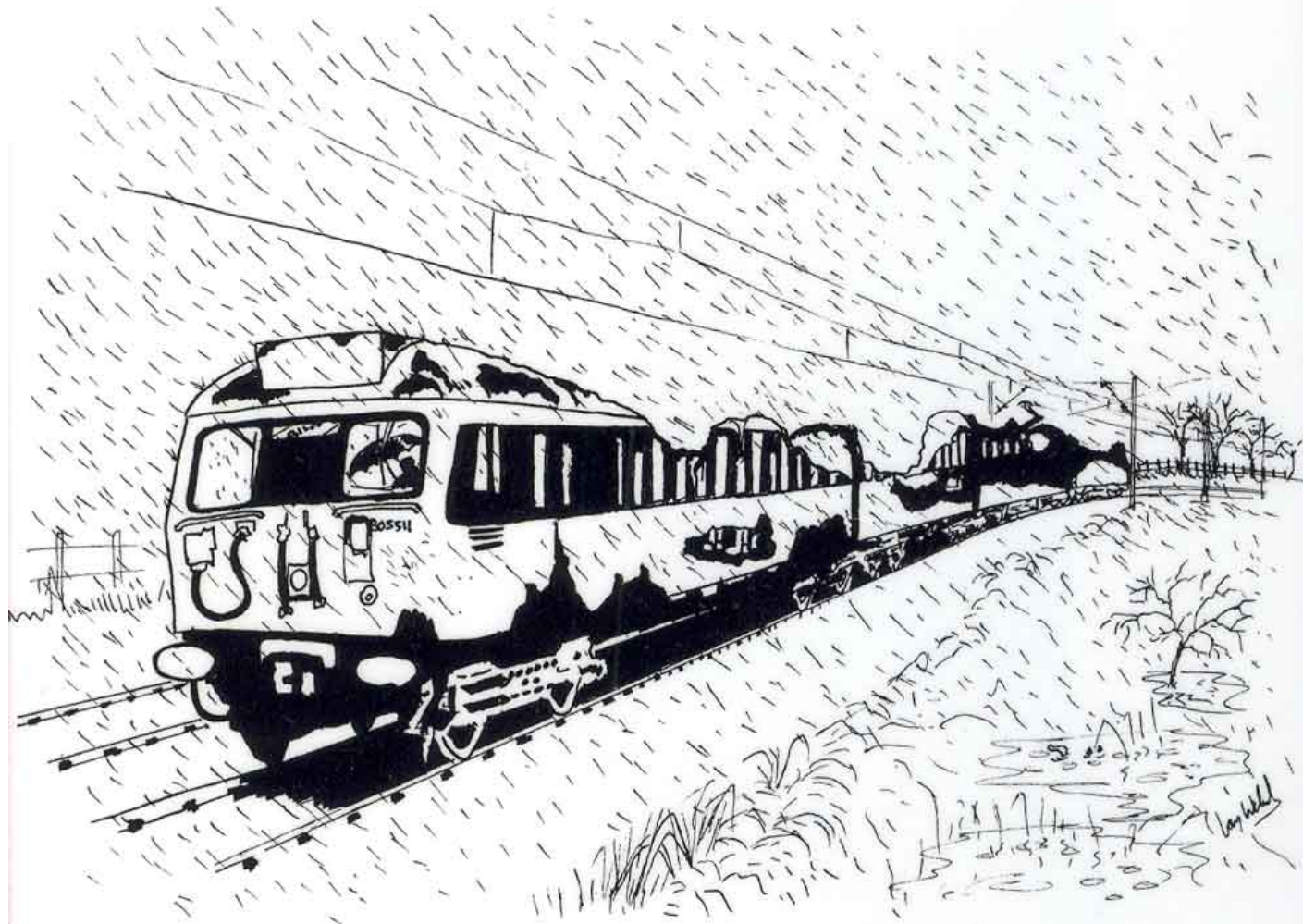
**FIGURE 2.6**

An example of acid precipitation damage to an outdoor statue. The statue, made of porous sandstone, was erected in 1702 as part of the gable of the entrance of the Castle at Herze, near Rocklinghausen, Germany. The left photo, taken in 1908, shows some stains and the loss of the left hand, but most of the face and right hand were intact after 206 years of exposure. The right photo, taken in 1969, shows the loss of most of the detail of the statue over 67 years [24]. (Reprinted with permission from the Westfälisches Amt für Denkmalpflege.)





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# F. Solving the Problem

1. **Cleaner energy (more investment in wind, hydro and solar power.)**
2. **Filters to remove  $\text{SO}_2$  from exhaust of fossil fuels combustion. (useful  $\text{CaSO}_4$  for drywall can be made this way)**
3. **Legislation: limit release of sulfur dioxide.**