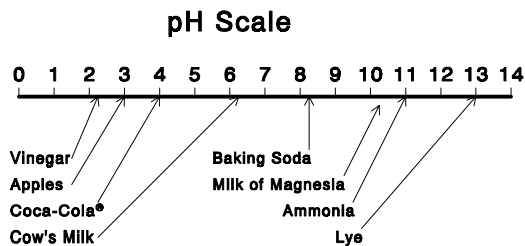


Acid Rain

Based on Mader, Sylvia S. 1996. *Biology* - 5th Ed. WCB
and
Cox, G.W. 1997. *Conservation Biology* - 2nd ed. WCB
and
Levine, J.S. and K.R. Miller. 1994. *Biology: Discovering Life*. D.C. Heath

Reading: Chapter 23 in Cox – Chapter 7 in Levine and Miller
Online study guide at: <http://www.marietta.edu/~biol/110/arain.html>

Acid Deposition



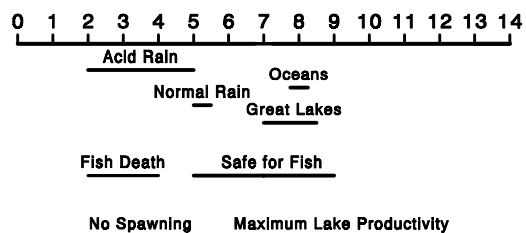
I. pH

A. **measure of acidity**

1. concentration of H^+ ions
2. ranges from 0 to 14
3. neutral
4. logarithmic
5. normal rain 5.0 - 5.6 due to acid formed by CO_2 in air
6. acid precipitation less than 5.0

Video: 12925

Ecological Implications of pH



II. Causes

A. burning of fossil fuels

1. sulfur

- a) present in fuels
- b) mostly from coal-burning

2. nitrogen

- a) forms in internal combustion engines, power plants
- b) mostly from power plants

B. burning of forests, volcanoes, etc.

III. effects on forest ecosystems

A. forest decline

1. increased mortality and reduced growth

2. seen in eastern US, western Europe

- a) Germany - 1960's
- b) Europe - 35% affected by 1988
- c) Czechoslovakia - 71% of forests affected
- d) Germany - 52% of forests affected
- e) billion damage in Europe for 1990 alone
- f) greatest effects downwind from polluting regions,
and where soil has no buffering capability

3. hypotheses:

- a) direct damage to foliage
- b) leaching of nutrients from soil
- c) aluminum toxicity
- d) increased frost vulnerability

4. damage due to acid deposition probably linked to other stresses

IV. other effects:

A. damage to aquatic systems (details later)

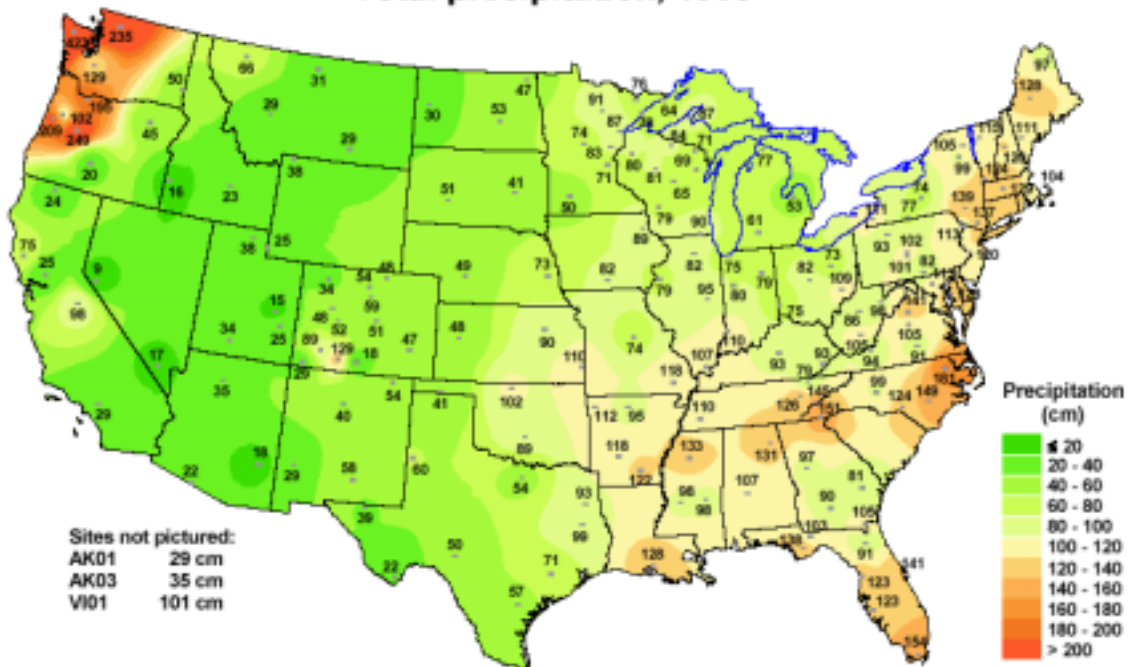
B. corrosion

C. health (respiratory stress)

V. Maps:

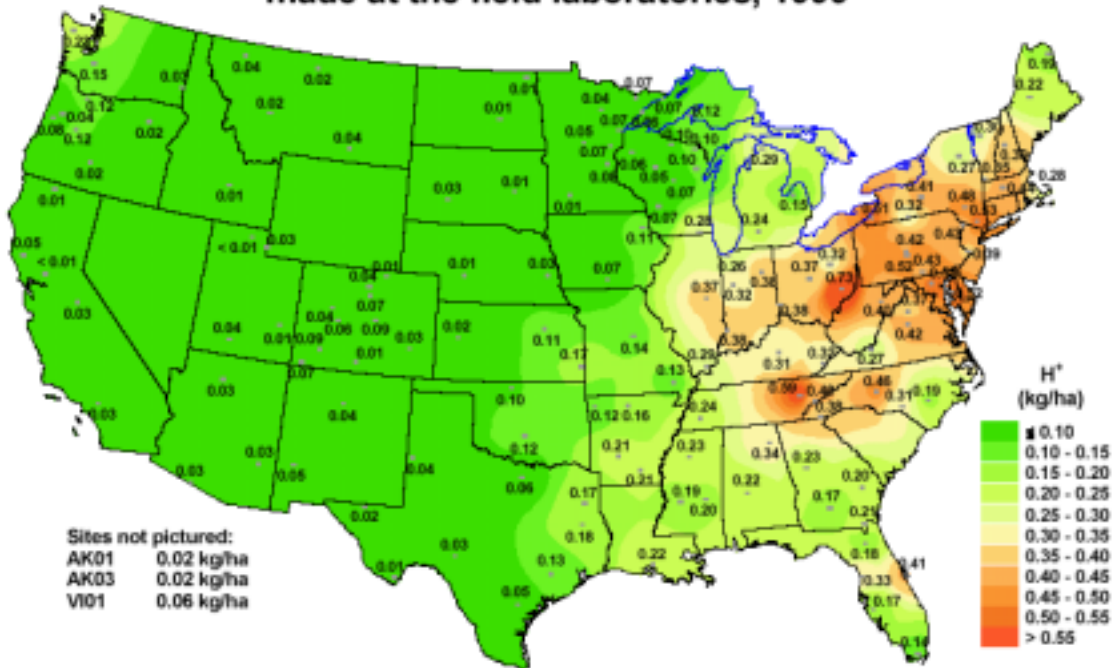
A. [US - Link](#)

Total precipitation, 1999



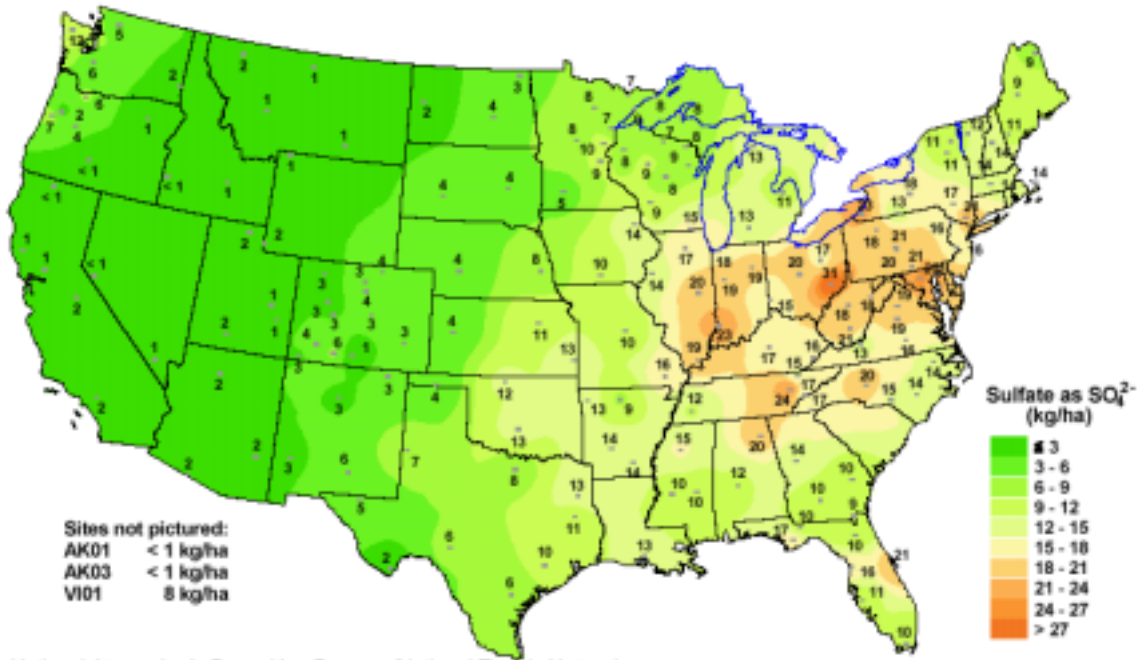
National Atmospheric Deposition Program/National Trends Network
<http://nadp.sws.uiuc.edu>

Estimated hydrogen ion deposition from measurements made at the field laboratories, 1999



National Atmospheric Deposition Program/National Trends Network
<http://nadp.sws.uiuc.edu>

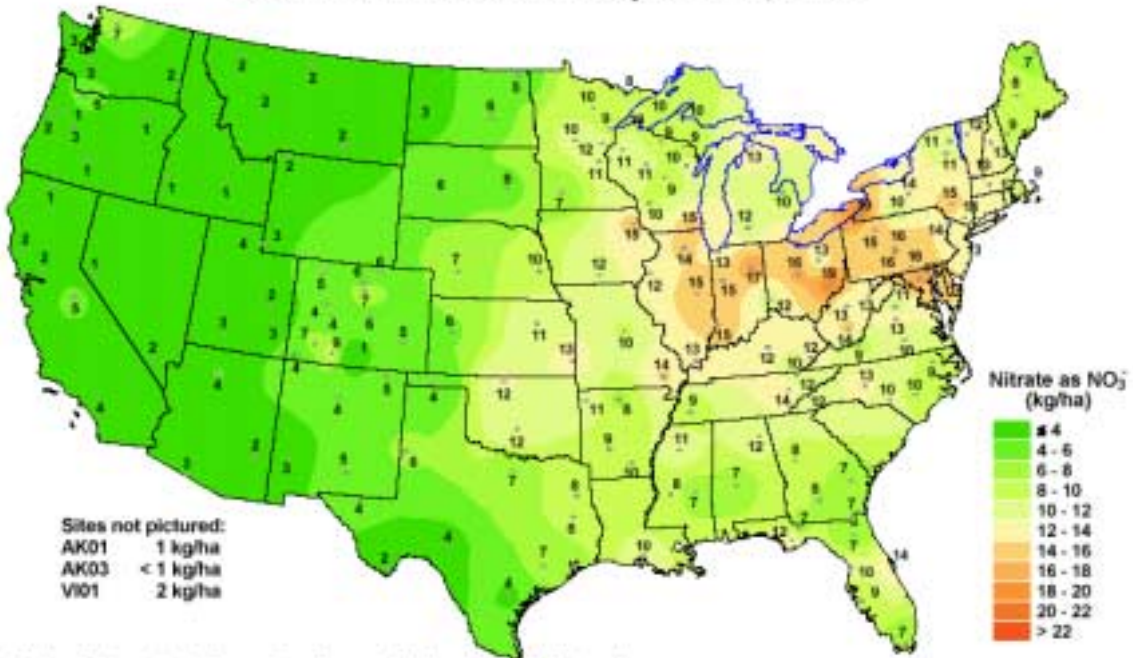
Estimated sulfate ion deposition, 1999



Sites not pictured:
AK01 < 1 kg/ha
AK03 < 1 kg/ha
VI01 8 kg/ha

National Atmospheric Deposition Program/National Trends Network
<http://nadp.sws.uiuc.edu>

Estimated nitrate ion deposition, 1999



Sites not pictured:
AK01 1 kg/ha
AK03 < 1 kg/ha
VI01 2 kg/ha

National Atmospheric Deposition Program/National Trends Network
<http://nadp.sws.uiuc.edu>