Linking
Soil and Air Quality

Alan J. Franzluebbers

Ecologist

Watkinsville GA

Air Quality Issues

Particulate Emissions

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Particulate Emissions

http://z.about.com/d/phoenix/1/0/c/u/duststorm01.jpg

Air Quality Issues

Ammonia Emissions

www.ars.usda.gov/SP2UserFiles/Place/66570000/images/ammonia1_2006cw.jpg

Air Quality Issues

Malodorous Compounds

www.iger.bbsrc.ac.uk/Ammonia_Inventory/sources.htm

www.researchtraining.org/moduletext.asp?intModuleID=804

www.iger.bbsrc.ac.uk/Ammonia_Inventory/sources.htm

Air Quality Issues

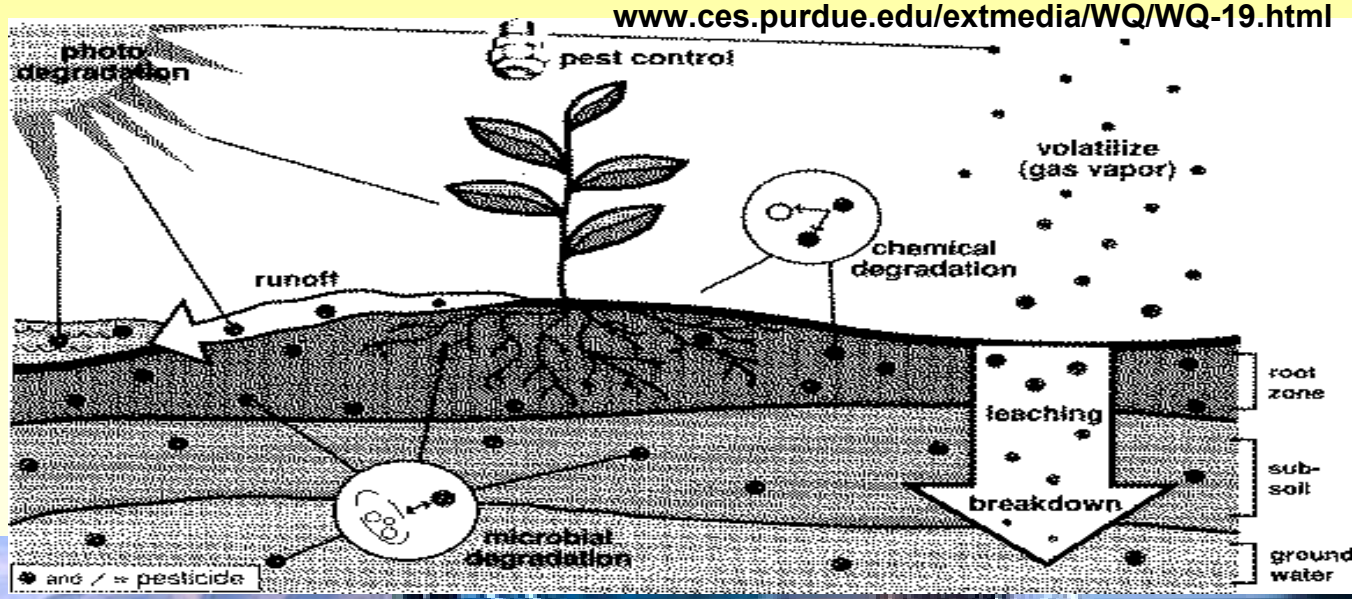
Ozone / Smog

Air Quality Issues

Pesticide Drift / Volatilization

www.pnwwaterweb.com/
initiatives/pnw_092.htm

www.ces.purdue.edu/extmedia/WQ/WQ-19.html

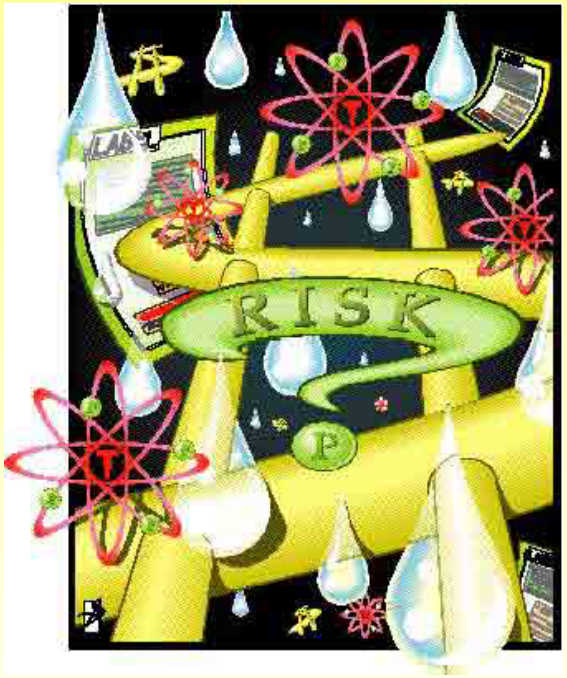


www.panna.org/campaigns/drift.html?searchMode

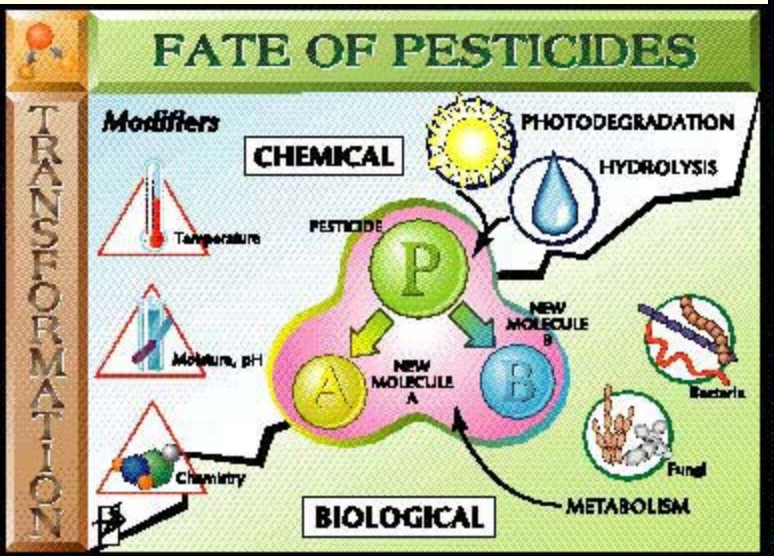
www.ars.usda.gov/is/pr/2005/050725.htm

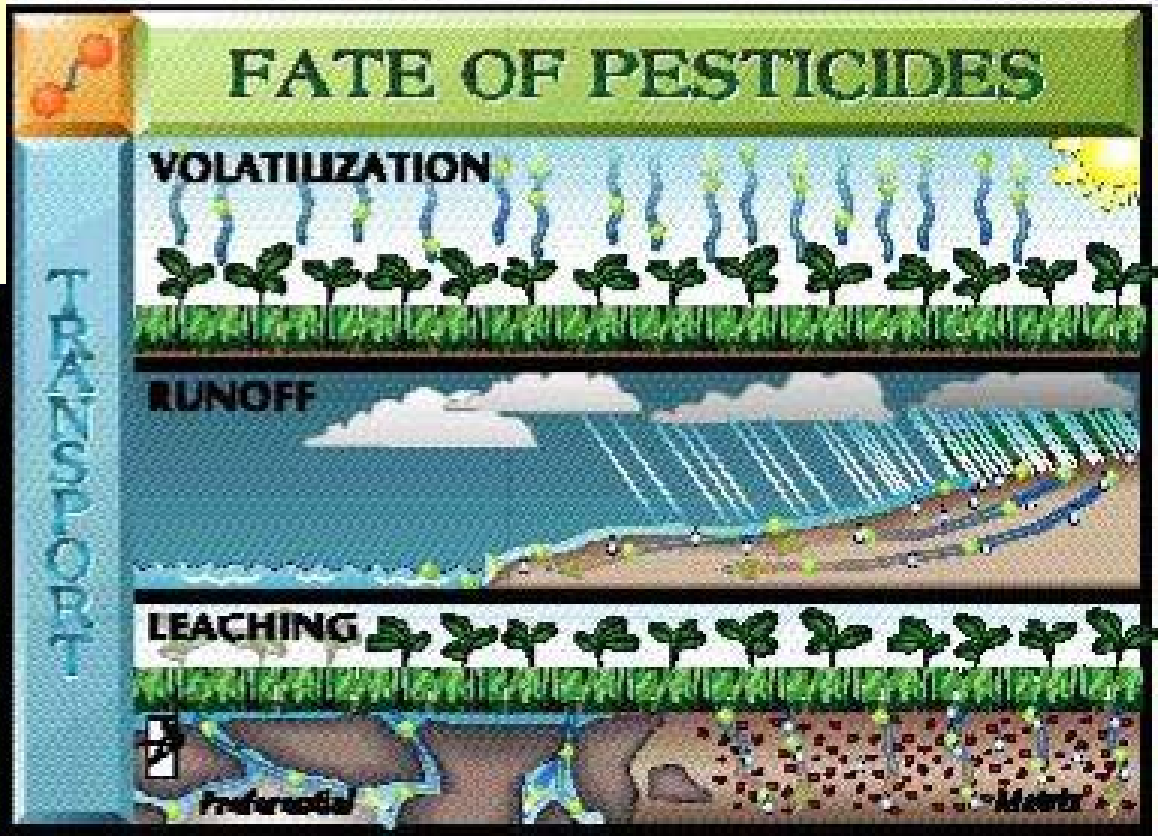
Air Quality Issues

Pesticide Drift / Volatilization



www.btny.purdue.edu/Pubs/PPP/PPP35.html
Artwork by Stephen Adduci





Air Quality Issues

Greenhouse Gas Emissions


Ames IA


Bowen Ratio

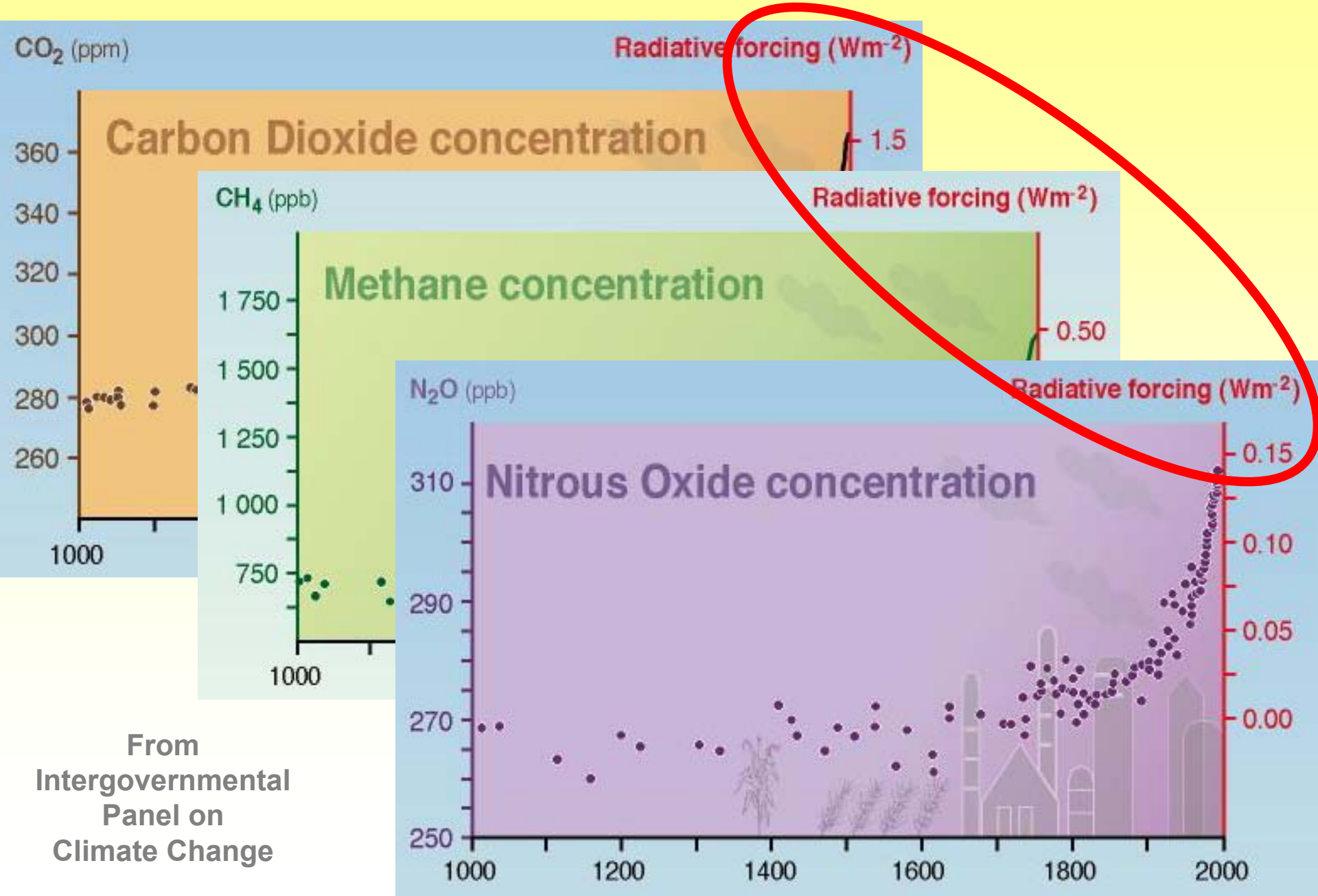

Bowling Green KY


Mandan ND


Fort Collins CO


Brookings SD

Global Concern is in the Air

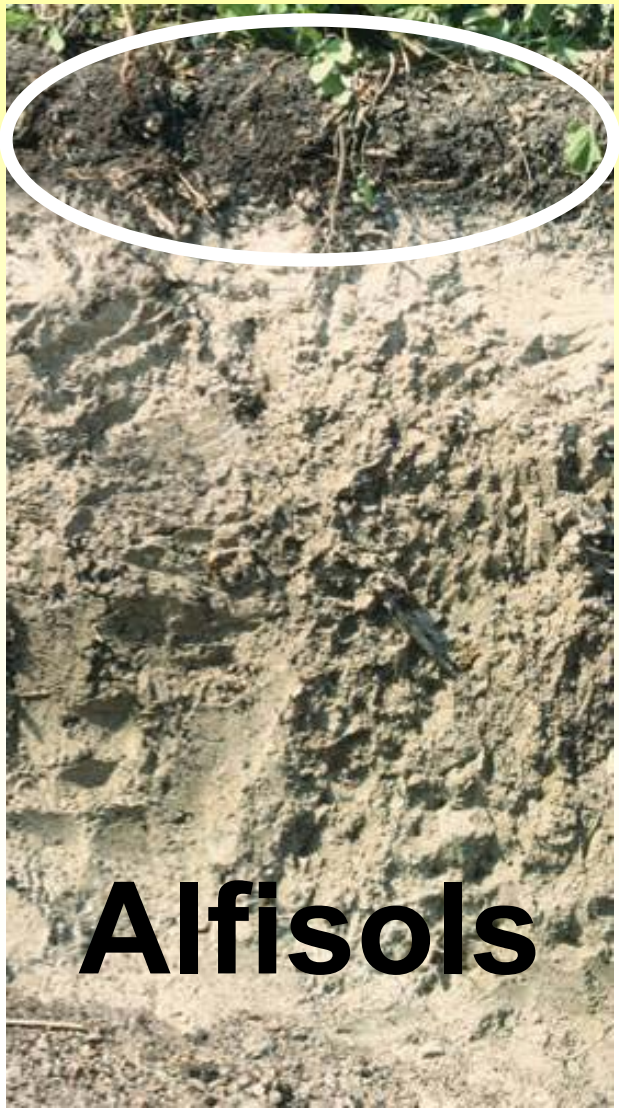


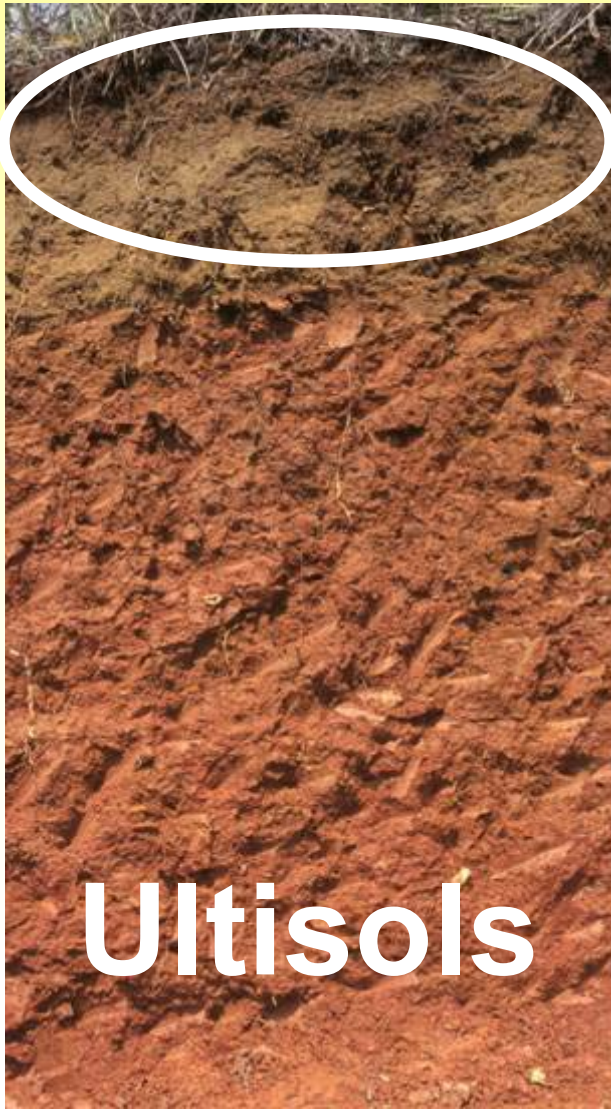
From Intergovernmental Panel on Climate Change

Soil Quality

Linking Soil and Air Quality

Soil Organic Carbon Sequestration





Soil Organic Carbon Sequestration

Animal Manure Application

Effect of manure application	Soil Organic C (Mg ha^{-1}) Without	With
2-yr studies (n=6)	19.8 ± 8.9	19.6 ± 8.4
11 ± 8-yr studies (n=8)	30.6 ± 11.4	36.8 ± 10.6
SOC sequestration for all (Mg ha^{-1} yr^{-1})	0.26 ± 2.15	
SOC sequestration for >2-yr studies	0.72 ± 0.67	

Conversion of C in poultry litter to soil organic C was 17 ± 15%.

Note: Manure application transfers C from one land to another.

Franzluebbers (2005) Soil Tillage Res. 83:120-147.

Soil Organic Carbon Sequestration

Soil carbon retention rate from animal manure application is affected by climatic condition:

Percentage of carbon applied as manure retained in soil (review of literature in 2001)

Temperate or frigid regions (23 ± 15%)

Thermic regions (7 ± 5%)

Moist regions (8 ± 4%)

Dry regions (11 ± 14%)

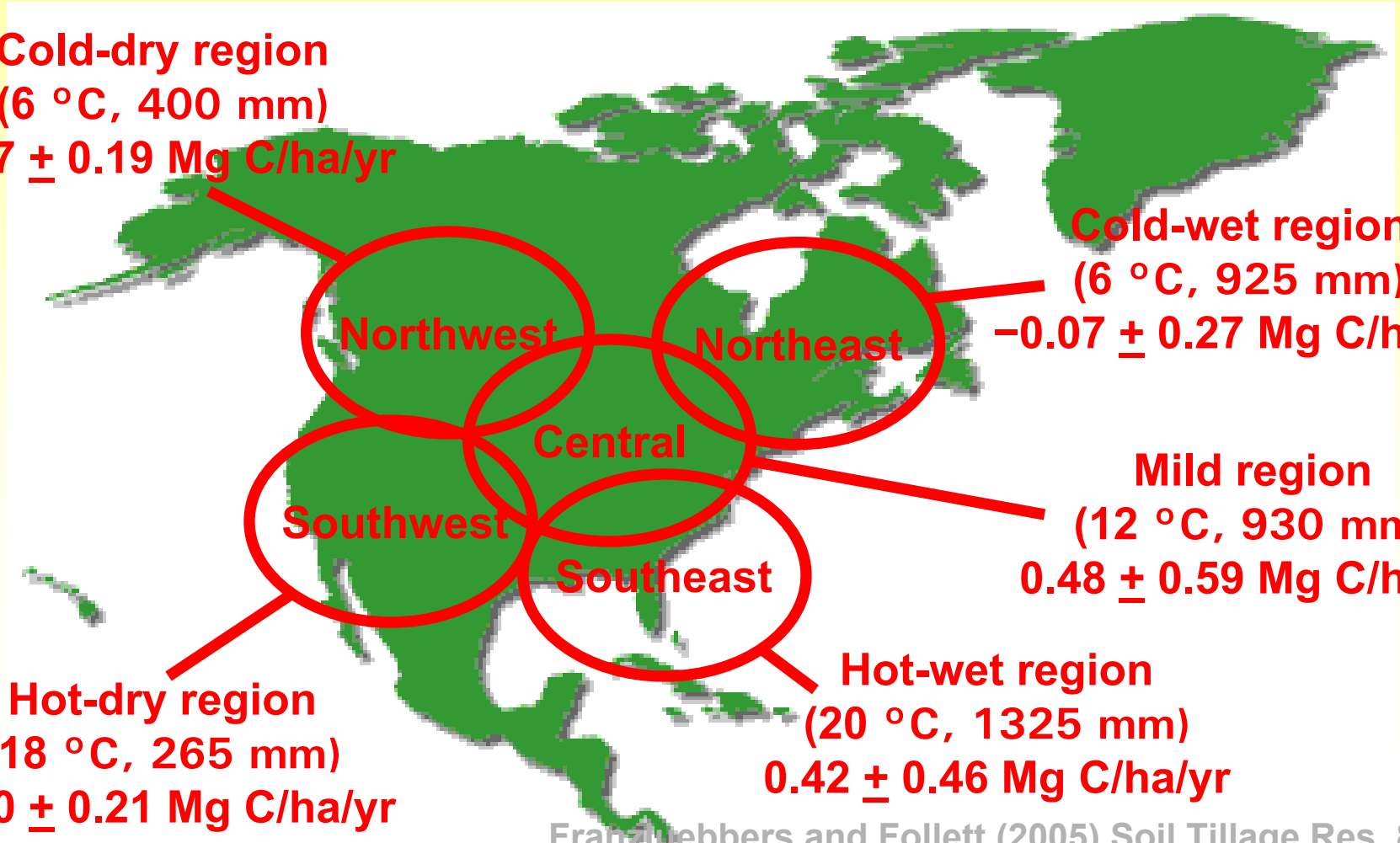
Soil Organic Carbon Sequestration

Conservation-Tillage Cropping

Minimal disturbance of the soil surface is critical in avoiding soil organic matter loss from erosion and microbial decomposition.

Soil Organic Carbon Sequestration

In the USA and Canada, no-tillage cropping can sequester an average of 0.33 Mg C/ha/yr.



Franzluebbers and Follett (2005) Soil Tillage Res. 83:1-8

Soil Organic Carbon Sequestration

No tillage needs high-residue producing cropping system to be effective.

Photos of 2 no-tillage systems in Virginia USA

Soil Organic Carbon Sequestration in the Southeastern USA

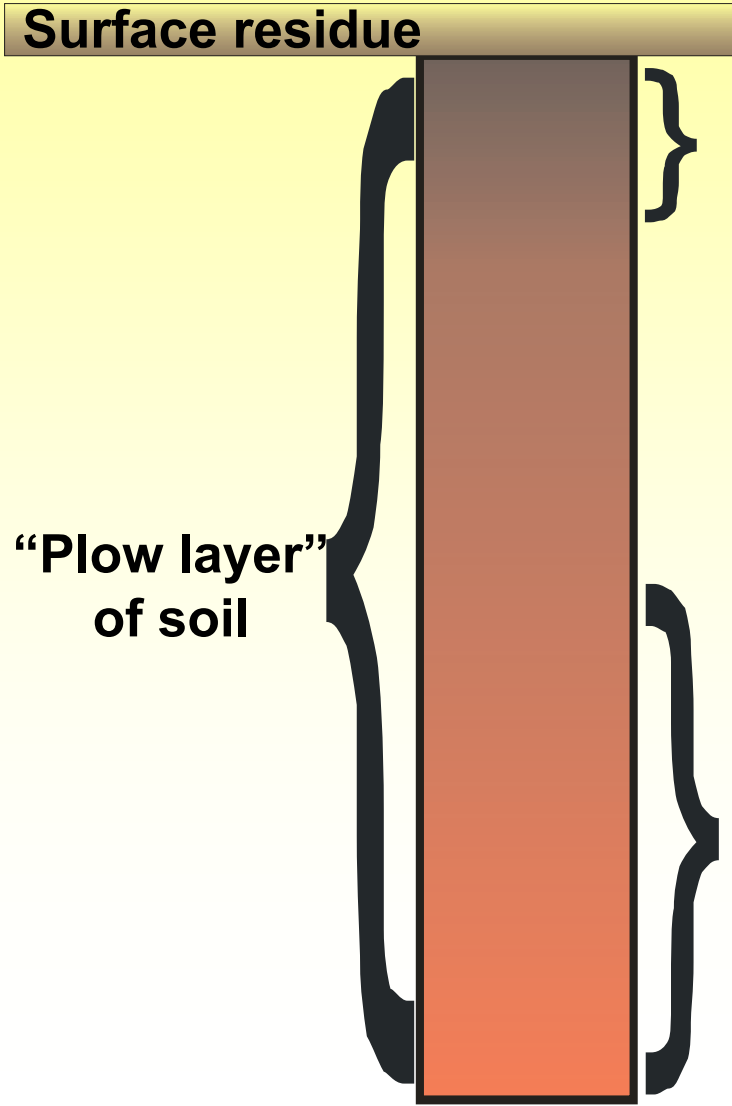
0.28 ± 0.44 Mg C/ha/yr (without cover cropping)

0.53 ± 0.45 Mg C/ha/yr (with cover cropping)

Franzluebbers (2005) Soil Tillage Res. 83:120-147.

Soil Organic Carbon Sequestration

Stratification Ratio of Soil Organic Carbon

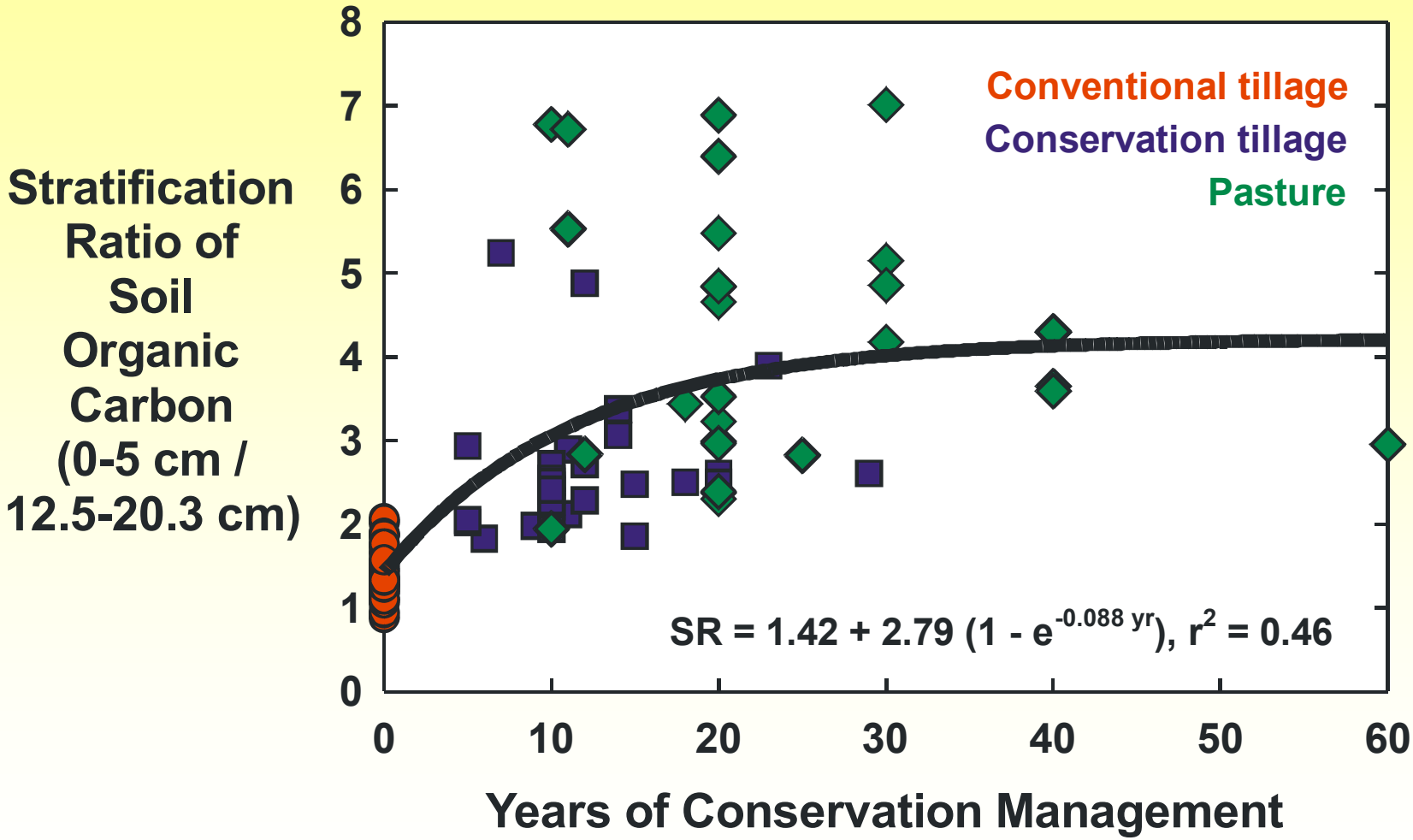


Stratification Ratio

$$\frac{\text{SOC (0-5 cm)}}{\text{SOC (15-30 cm)}}$$

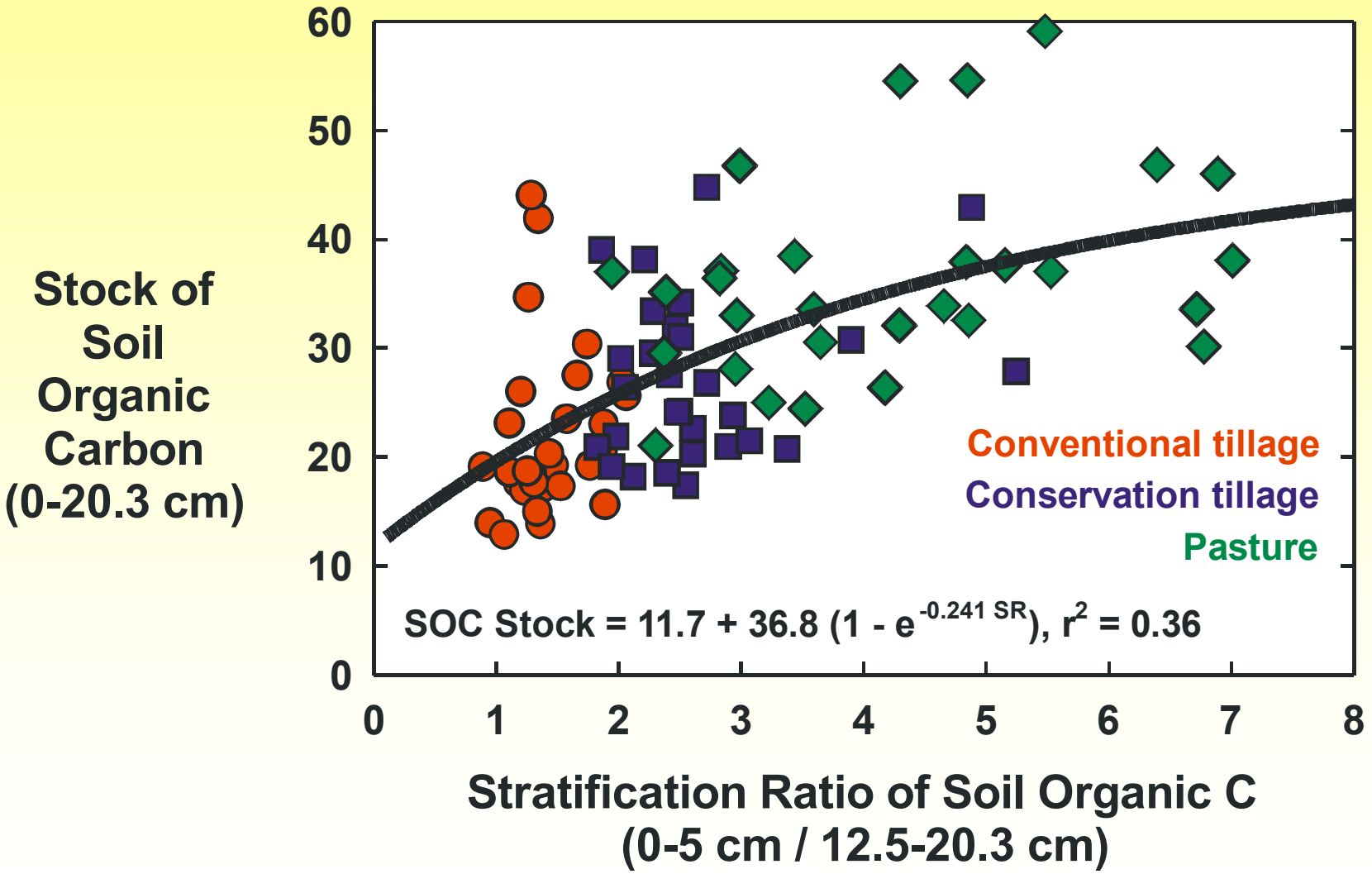
Plowed soils tend to have values near 1

Soil Organic Carbon Sequestration



Causarano et al. (2007) Soil Sci. Soc. Am. J. (in press)

Soil Organic Carbon Sequestration



Causarano et al. (2007) Soil Sci. Soc. Am. J. (in press)

Implications

✓ **Several air quality concerns are impacted directly or indirectly by soil quality**

✓ **Adoption of conservation management systems can help to address both air quality and soil quality concerns**

✓ **Significant research is being conducted on the mechanisms of soil and air quality deterioration / improvement, but research–extension–education activities are needed to demonstrate the advantages and disadvantages of system-wide management approaches to these complex natural resource issues**

✓ **Mitigation of greenhouse gas emissions with conservation management approaches will reduce the threat of global change and improve the quality of soil**