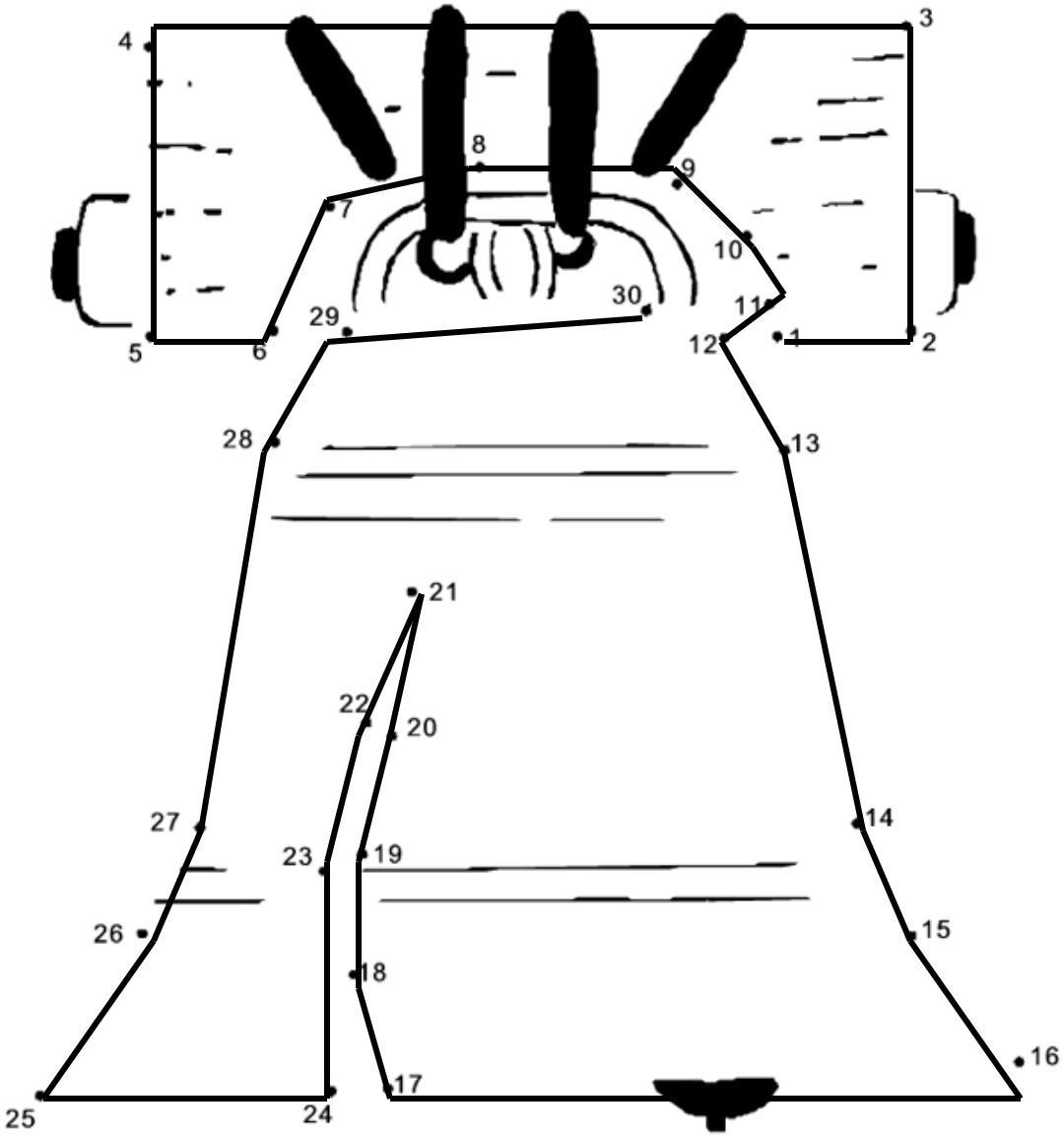
Wisconsin Agricultural Classic

Why Is Conserving Wisconsin Soil and Water Resources a Global Necessity?

Rick Cruse
Iowa State University

Global grain stocks tighten, deluge in Australia

By Bruce Hextall
SYDNEY | Wed Jan 12, 2011 10:17pm IST
SYDNEY (Reuters) - Australia's worst floods in decades shut down a key grains port, while the United States signaled further tightening of domestic and global supplies, heightening fears over surging food inflation.
Corn and soybean futures in Chicago jumped to 30-month highs after the U.S. government reduced its estimate of corn and soybean production in the United States and Argentina, where hot, dry weather has begun to take a toll on crops.
Estimates of Australia's wheat crop and exports were also cut, at a time when there are concerns with the U.S. crop due to dry weather. Last year, Russia banned exports after the worst drought in a century decimated production.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Demand for Higher Quality Food

- 3 billion people → middle class (next 20 years)[1]
- More meat – 73% ↑ by 2050[1]

6 – 8 lb

→

1 lb

[1]United Nations Secretary-General's High-level Panel on Global Sustainability (2012). Resilient People, Resilient Planet: A future worth choosing. New York: United Nations.

Meat Consumption, Soils & Water?

- 5 oz meat/day/capita – US[1]
- Assume 3 billion eat 4 oz/day
- 750,000,000 lb meat/day
- ??? 1,300 lb beef animals

- **1,000,000 animals/day**

[1]USDA/Economic Research Service, www.ers.usda.gov

WHY?

Supply/Productivity Limitations

- Land conversion

- 41 Million US Acres 1982-2007 (NRI)
- 363,000 prime acres in WI (NRI)
- 7% Ag land conversion by 2030[1]

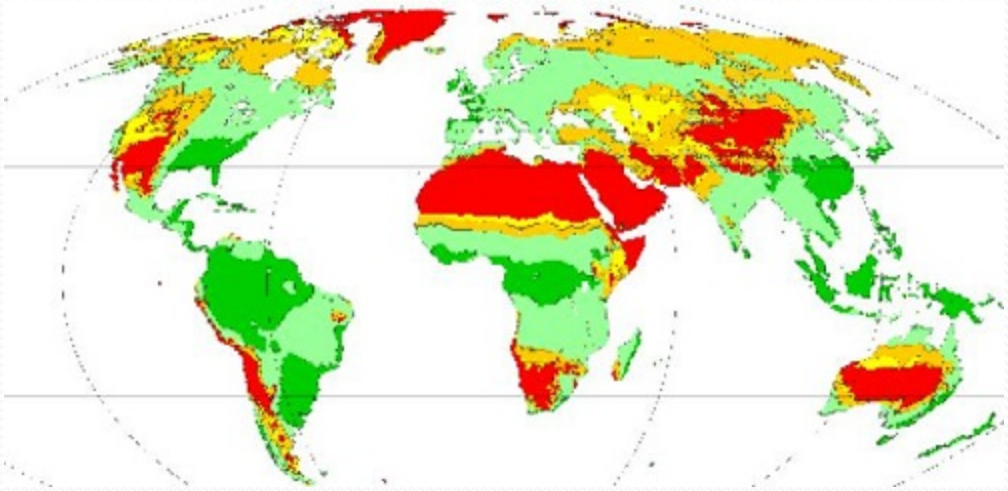
[1]FAO. 2002. World Agriculture: Towards 2015/2030. FAO, Rome.

Brazil – Immense Untapped Capacity

- ~ 400,000,000 Ha yet to be developed
- ~ 15% lost to infrastructure for development
- ~ 340,000,000 Ha expansion potential

The Rest of the Story

- 7% world ag land converted by 2030[1] ~ 342,000,000 Ha
- Brazil expansion ~ 340,000,000 Ha



[1] FAO. 2002. World Agriculture: Towards 2015/2030. FAO, Rome.

Supply/Productivity Limitations

- 25% Agricultural land seriously degraded

FAO. 2011. State of the world's land and water resources for food and agriculture. Summary Report. FAO. Rome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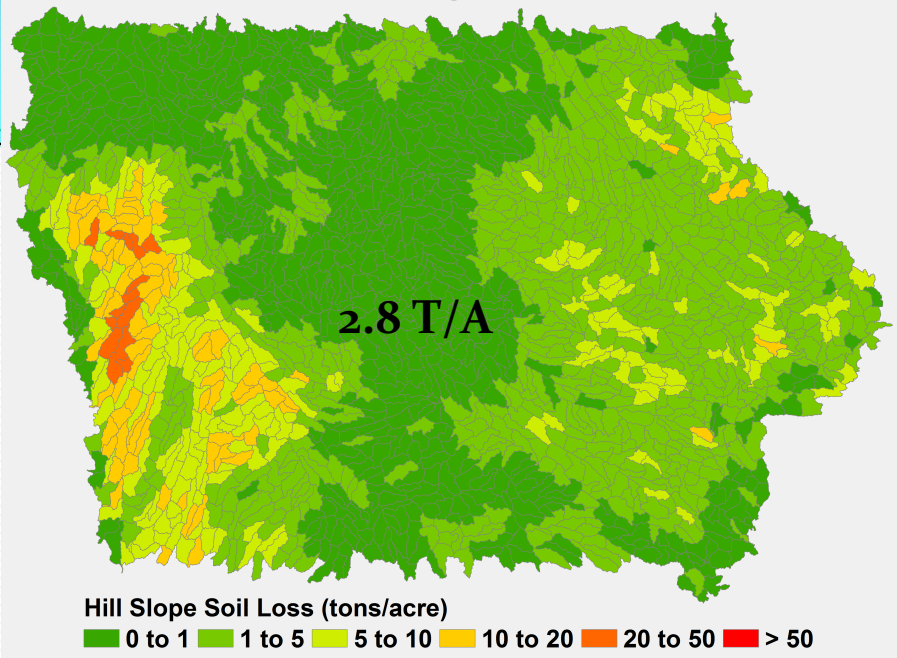
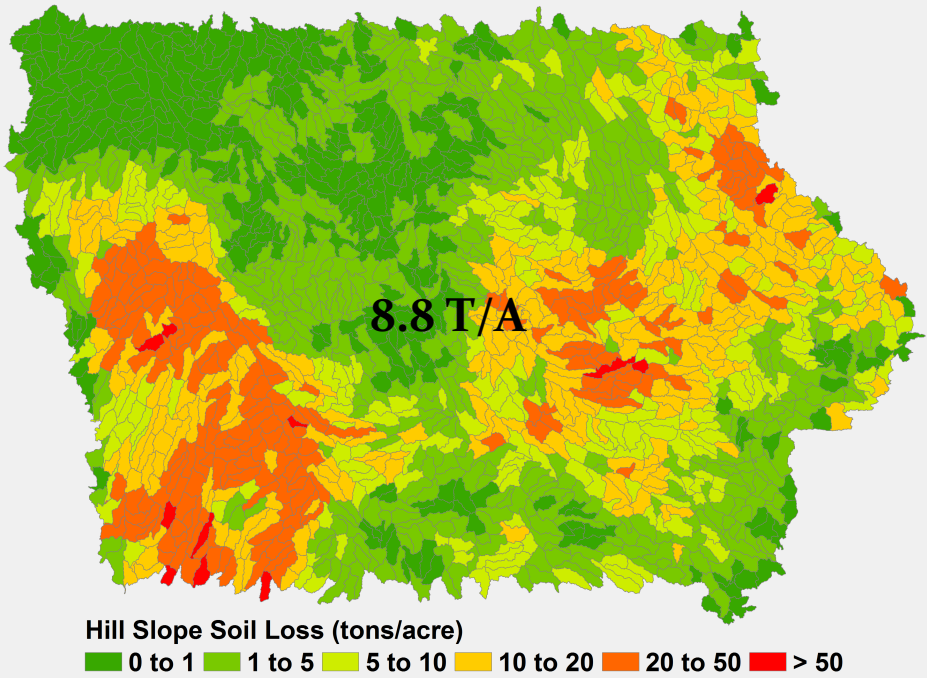
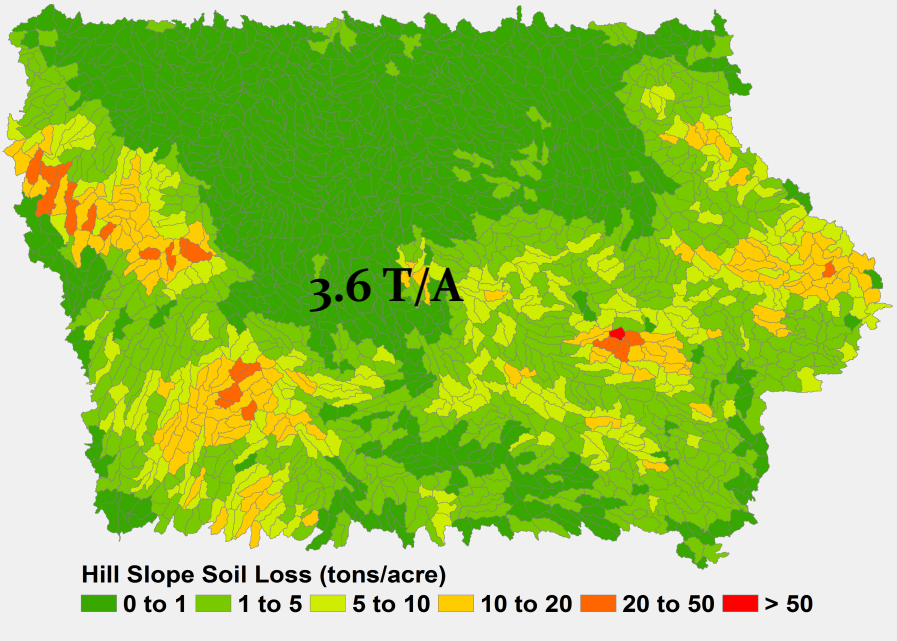
2007 Hill Slope Soil Loss



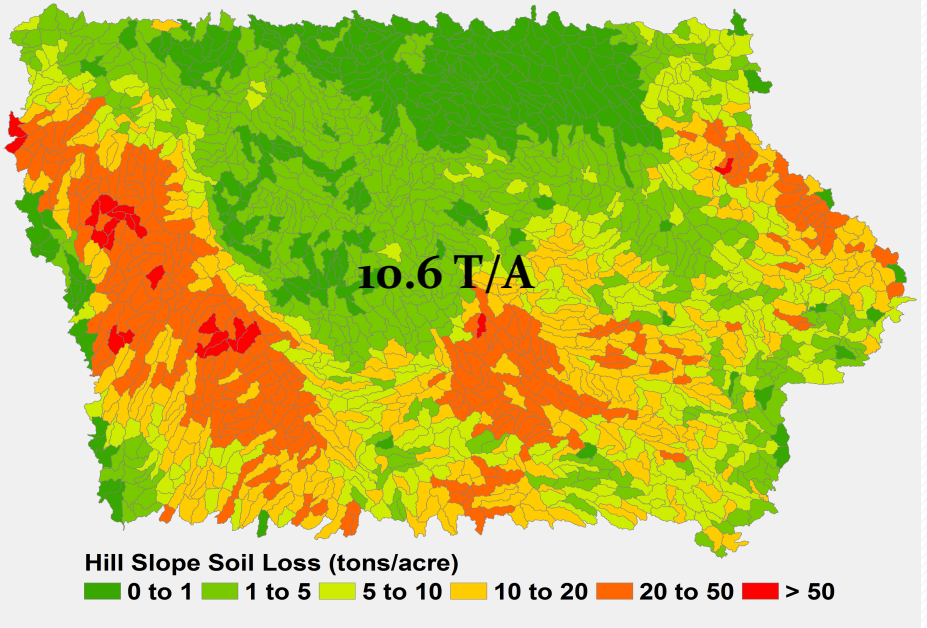
2008 Hill Slope Soil Loss



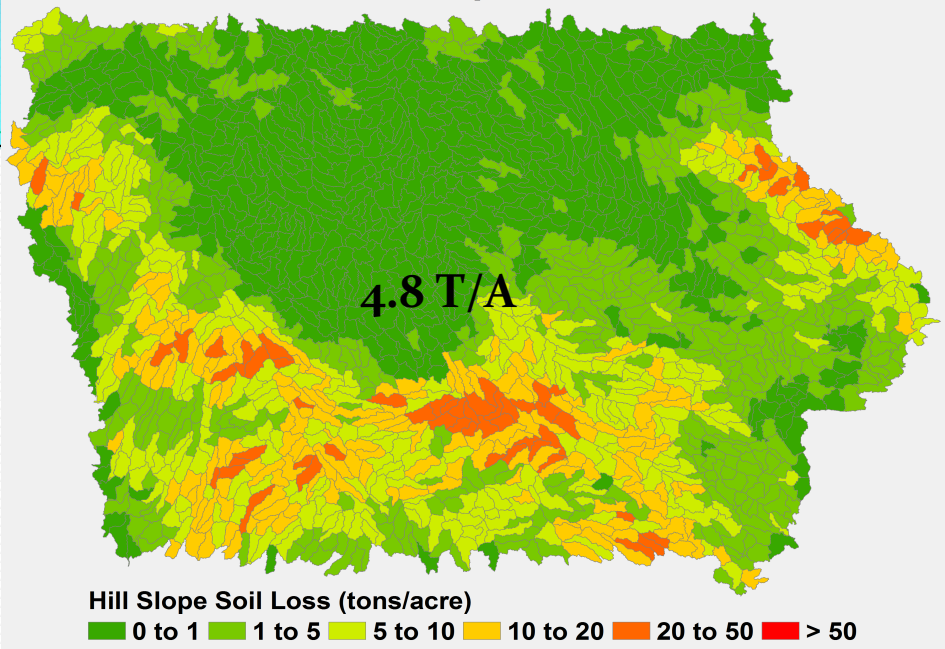
2009 Hill Slope Soil Loss



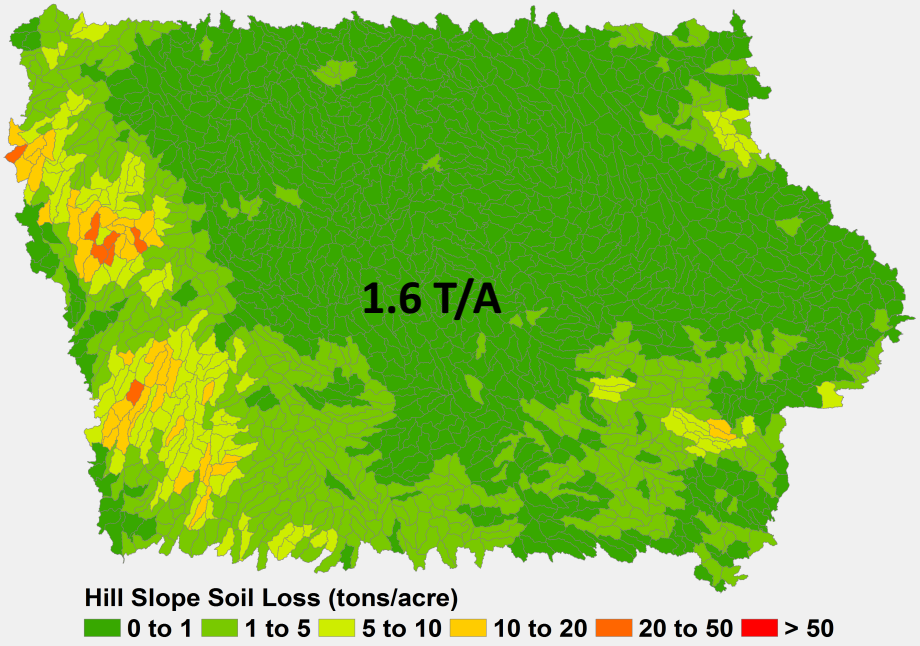
2010 Hill Slope Soil Loss



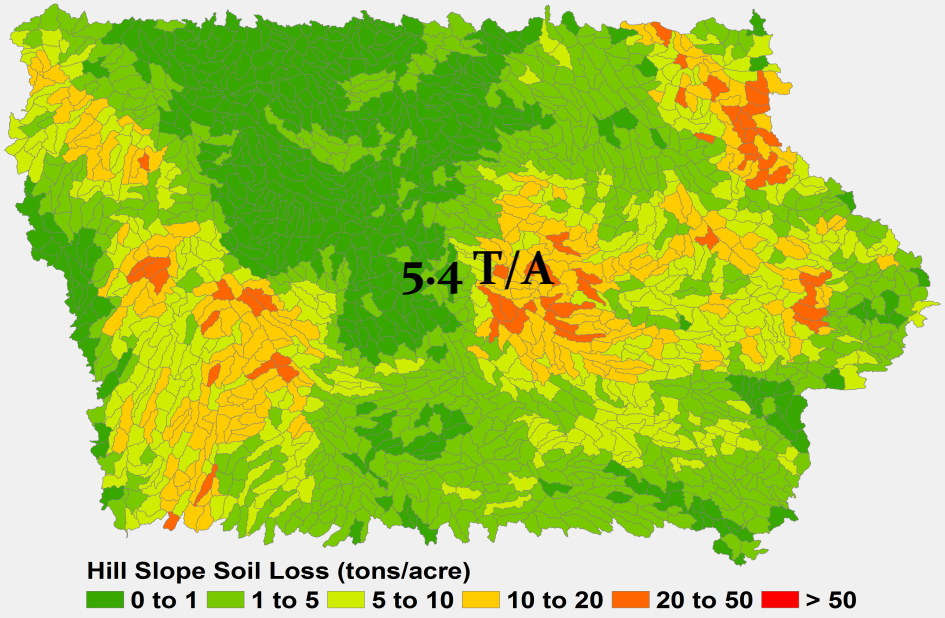
2011 Hill Slope Soil Loss



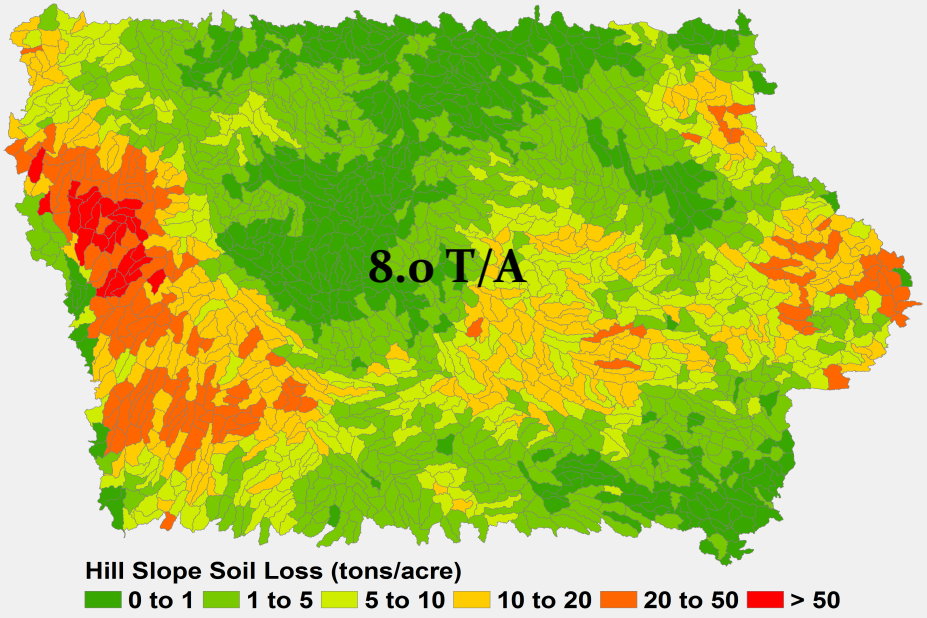
2012 Hill Slope Soil Loss



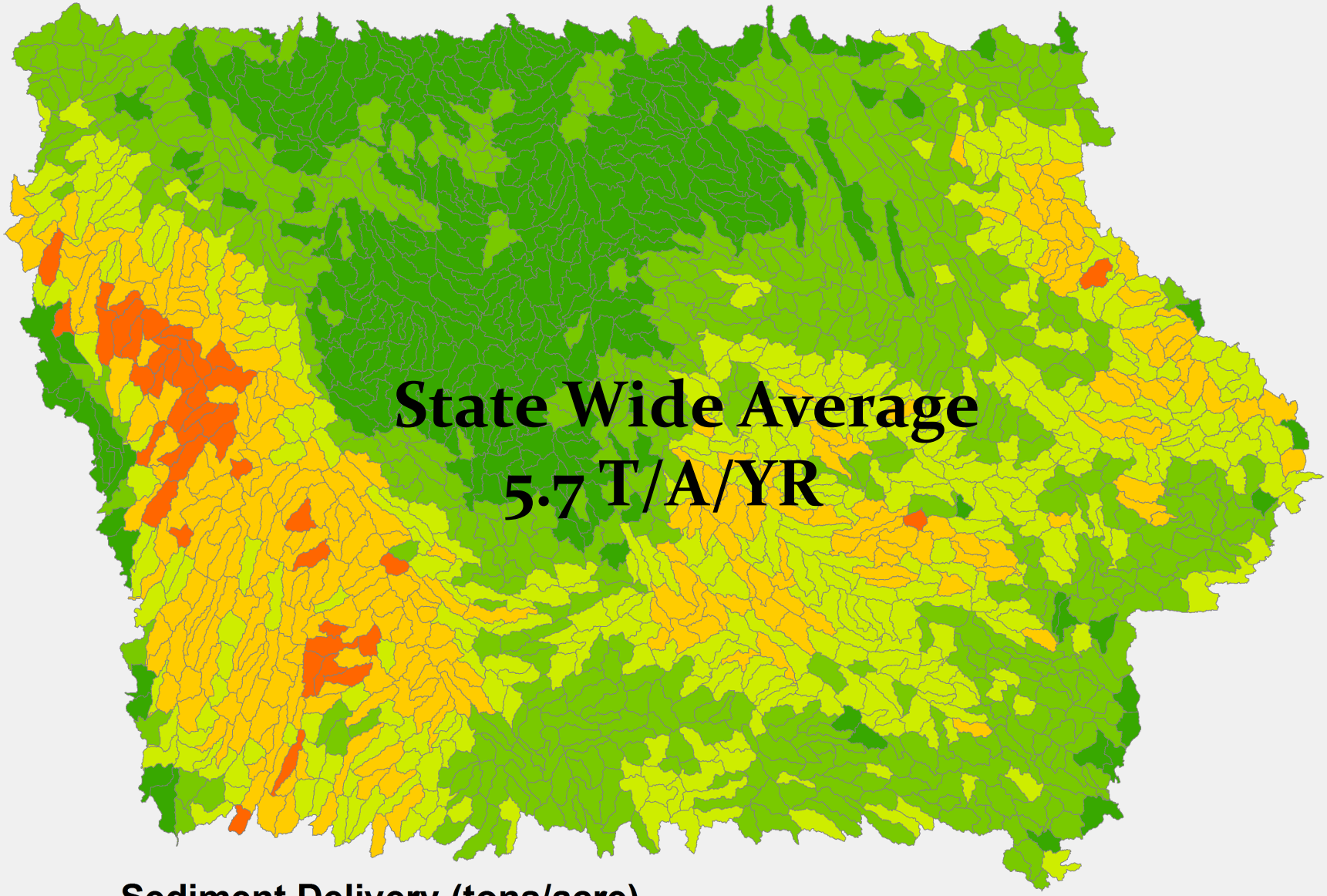
2013 Hill Slope Soil Loss



2014 Hill Slope Soil Loss



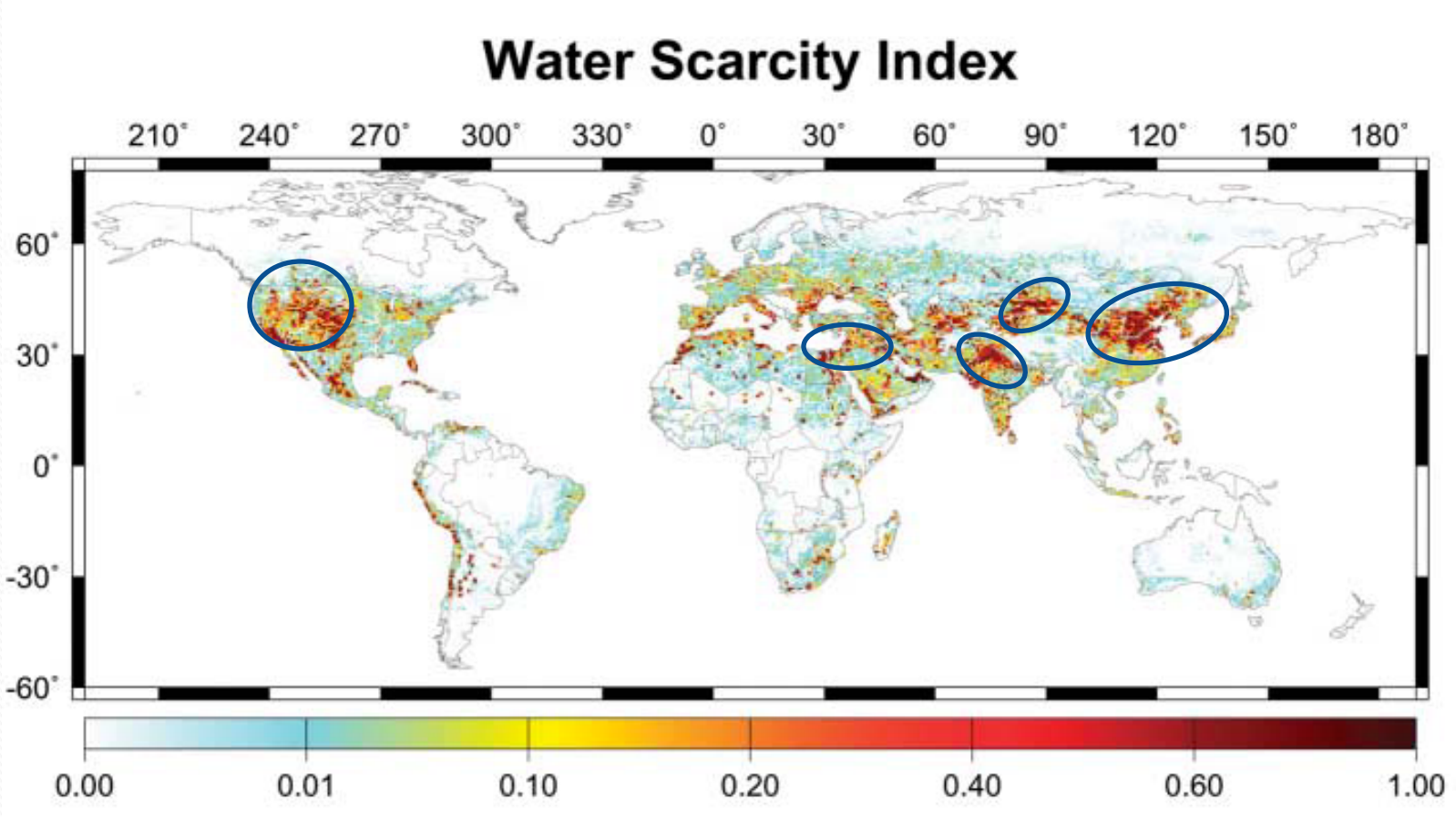
2007 to 2014 Average Soil Loss



Water Scarcity Index =

$$\frac{\text{Human Fresh Water Consumption}}{\text{Renewable Fresh Water}}$$

Oki, Taikan and Shinjiro Kanae. 2006. Global hydrological cycles and world water resources. Science. 313:1068-1072



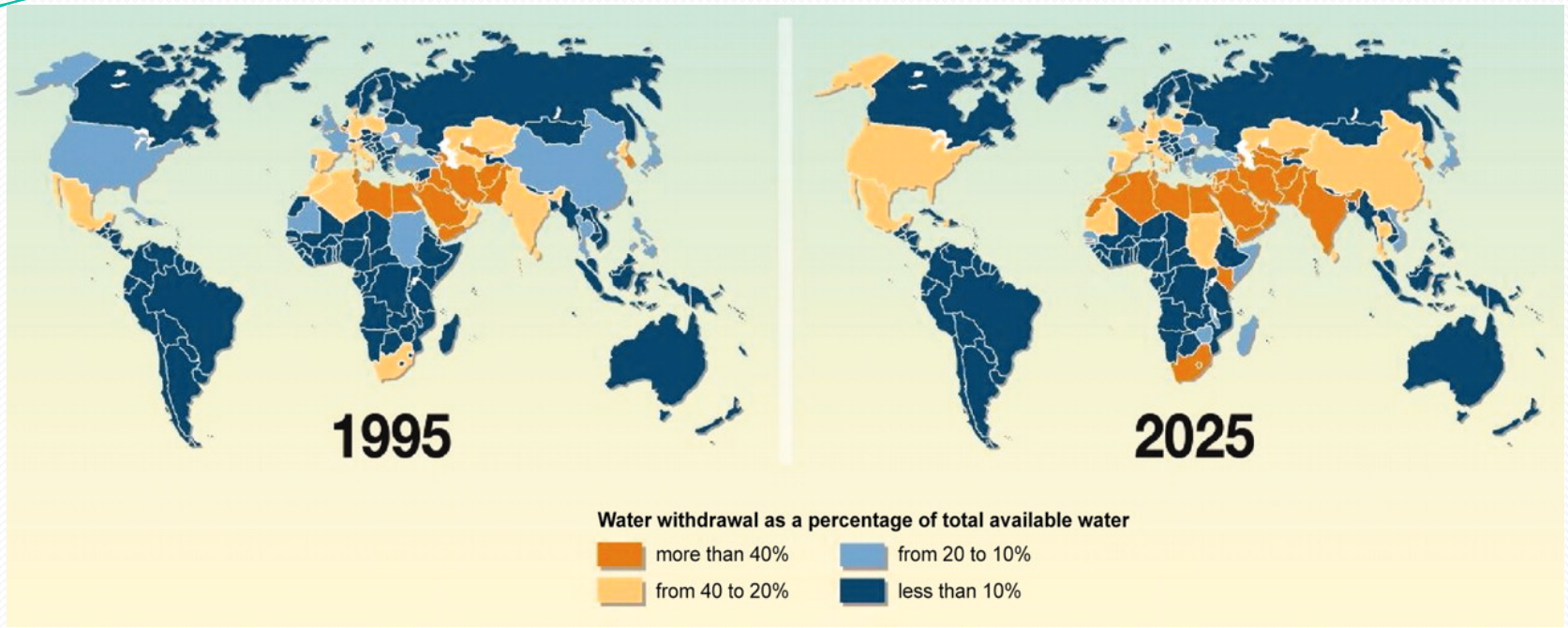
Oki, Taikan and Shinjiro Kanae. 2006. Global hydrological cycles and world water resources. Science. 313:1068-1072

Published by AAAS

Irrigation

- ~ 40% of world food comes from 18% of world's cropland[1]
  - India 3/5 of grain harvest
  - China 4/5 of grain harvest

[1]W Danielle Nierenberg, Linda Starke and Erik Assadourian. 2007 State of the World – 2006. World Watch Institute.



United Nations Environment Programme (UNEP)/GRID-Arendal Maps and Graphics Library, 2009].

High Plains Aquifer Depletion

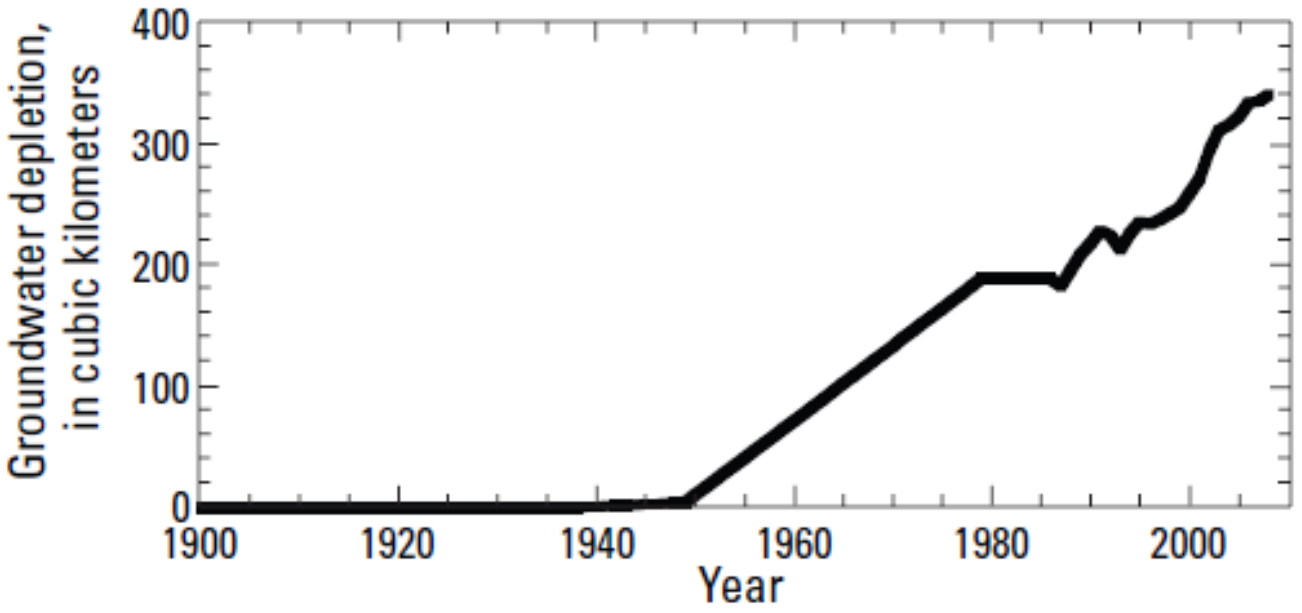
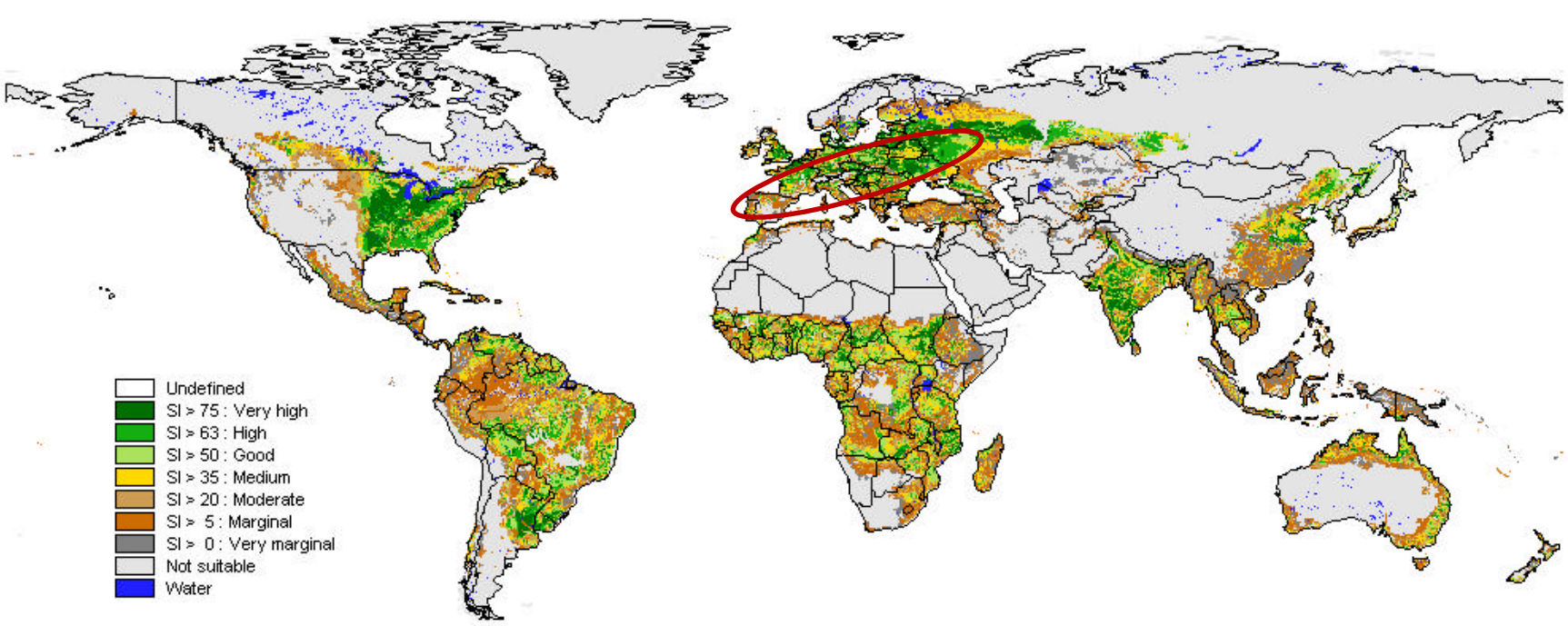


Figure 19. Cumulative groundwater depletion in the High Plains aquifer, 1900 through 2008.

Konikow, L.F., 2013, Groundwater depletion in the United States (1900–2008): U.S. Geological Survey Scientific Investigations Report 2013–5079, 63 p., *http://pubs.usgs.gov/sir/2013/5079*.

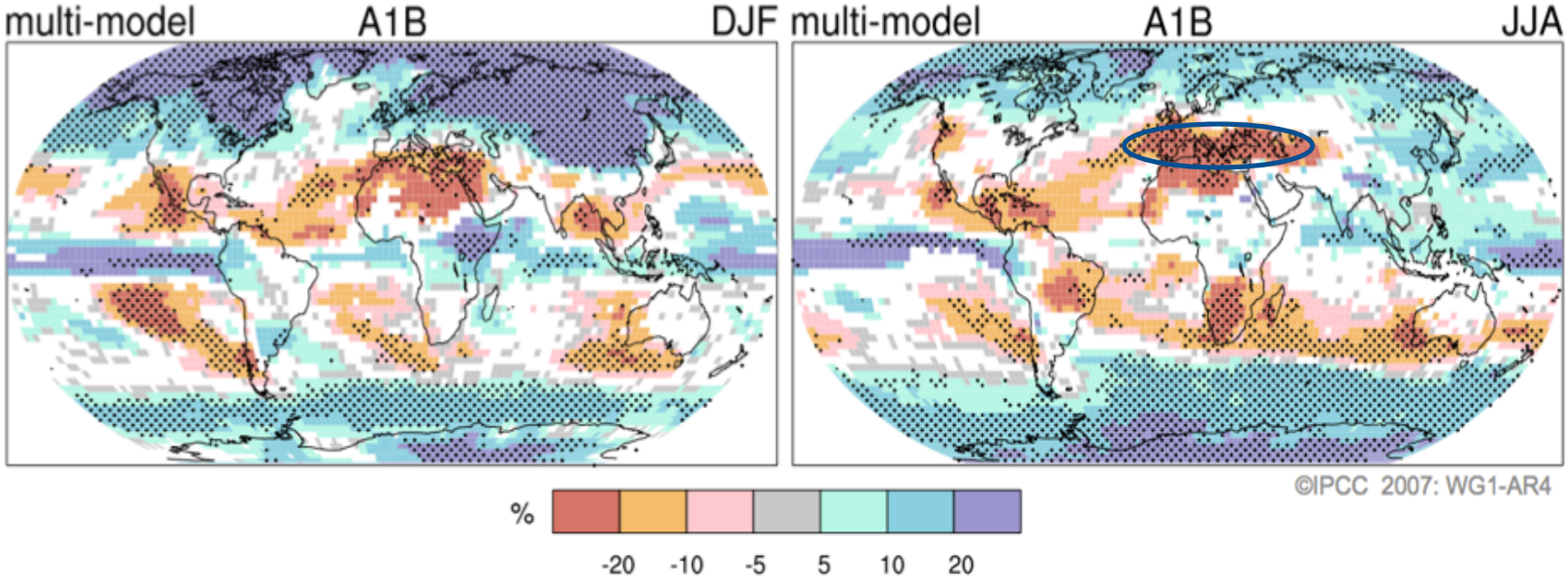
Terrain Suitability Index

Soil and Terrain Suitability Index (SI) for a Range of Rain-Fed Crops and Pasture Types for the Current Climate

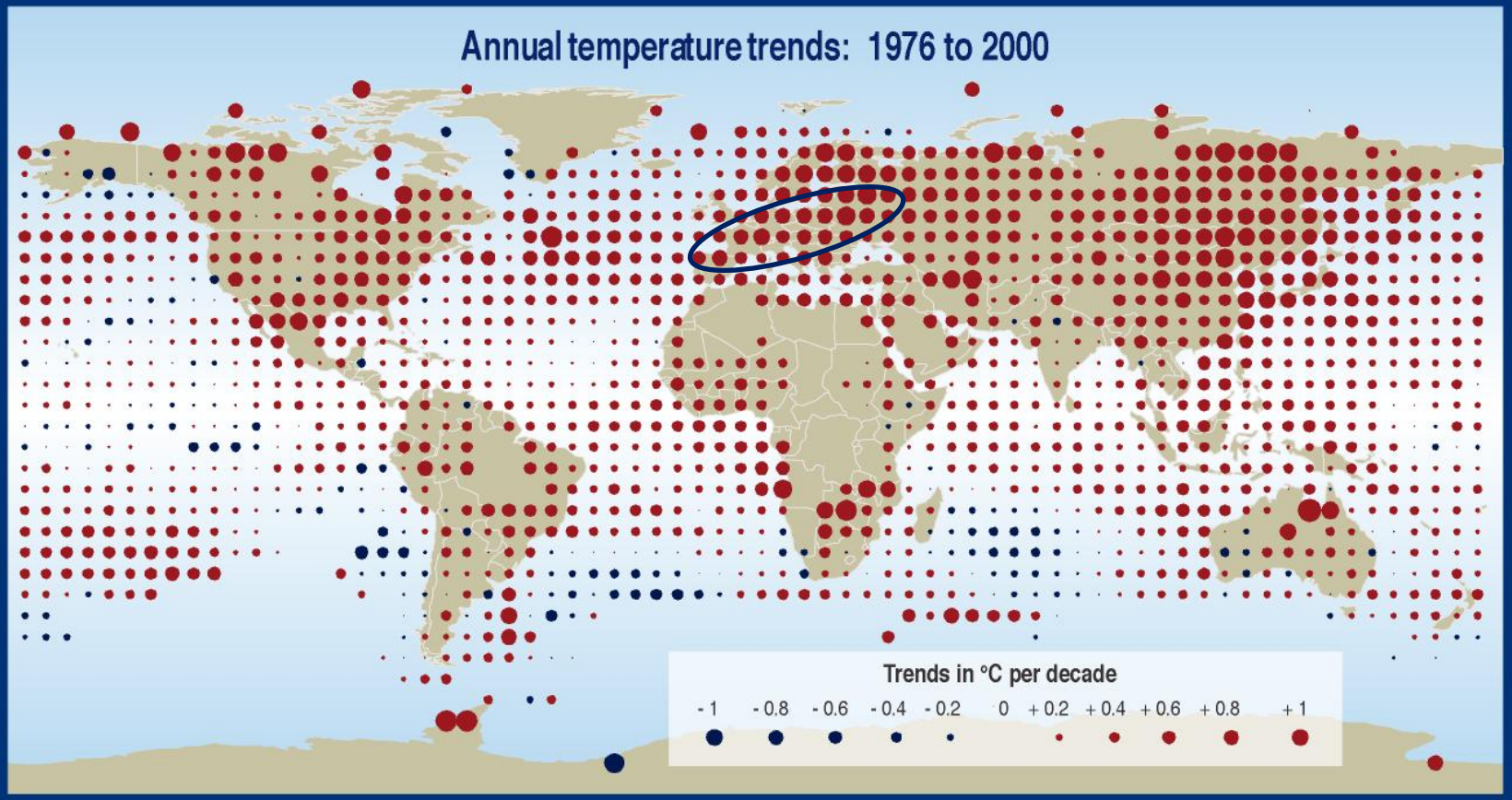


Fischer, et al., 2002: Global agro-ecological assessment for agriculture in the 21st century: methodology and results. Research Report RR-02-02. ISBN 3-7045-0141-7., International Institute for Applied Systems Analysis, Laxenburg, Austria, 119 pp. [On line at http://www.iiasa.ac.at/Research/LUC/Papers/gaea.pdf] Cited in the IPCC Fourth Assessment Report, Working Group II, Ch. 5, p. 280.

Projected Patterns of Precipitation Changes

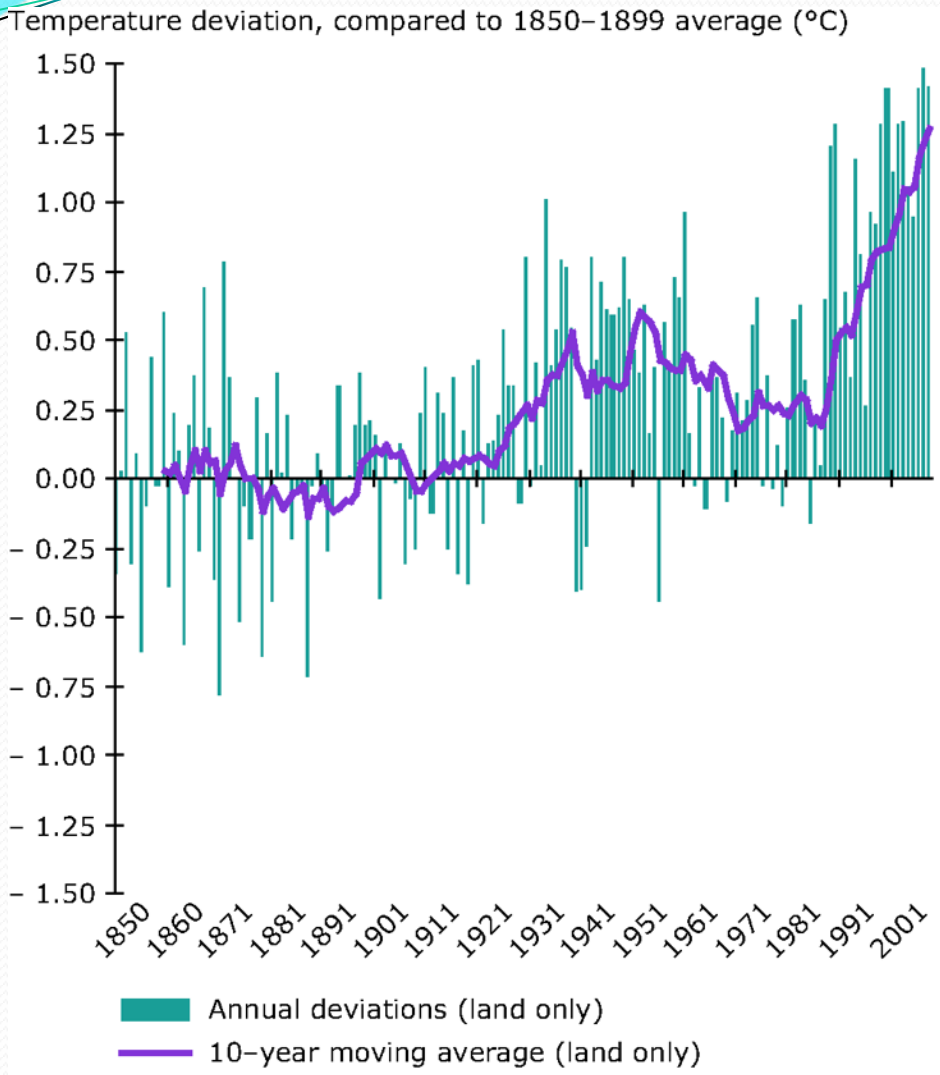


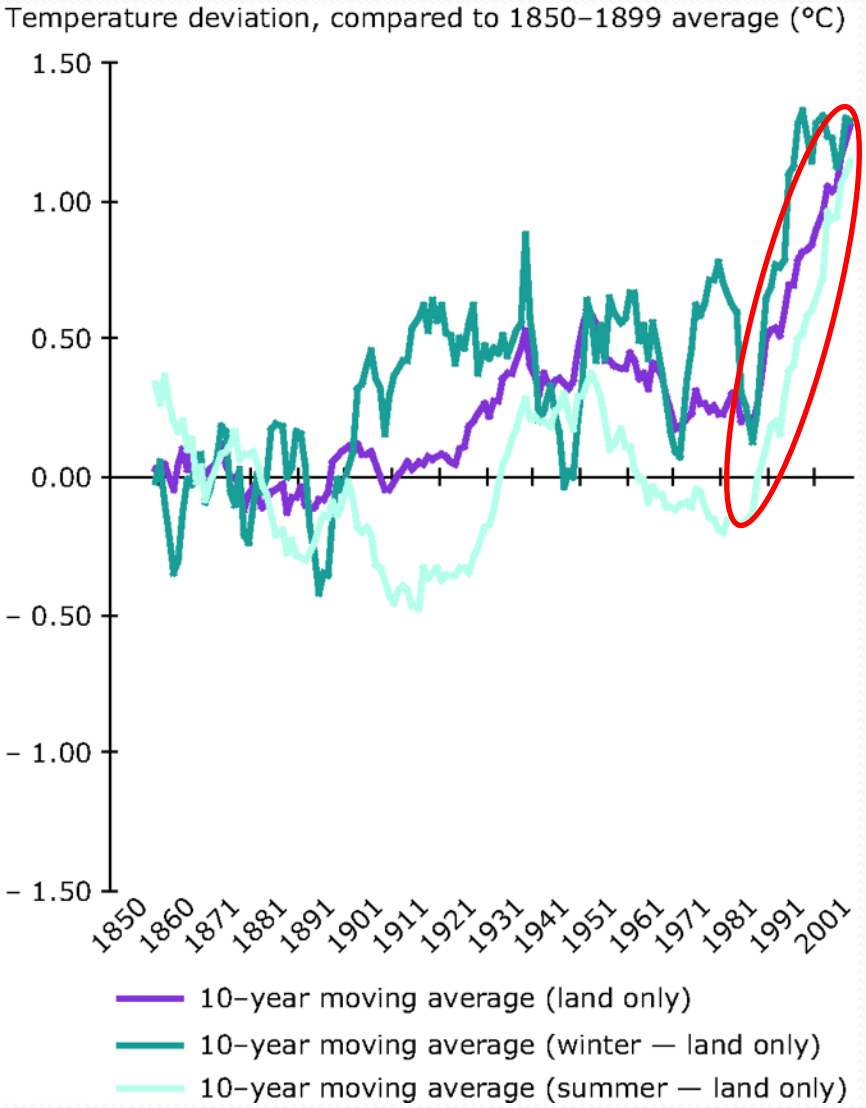
IPCC Fourth Assessment Report Summary for Policy Makers



SYR - FIGURE 2-6b

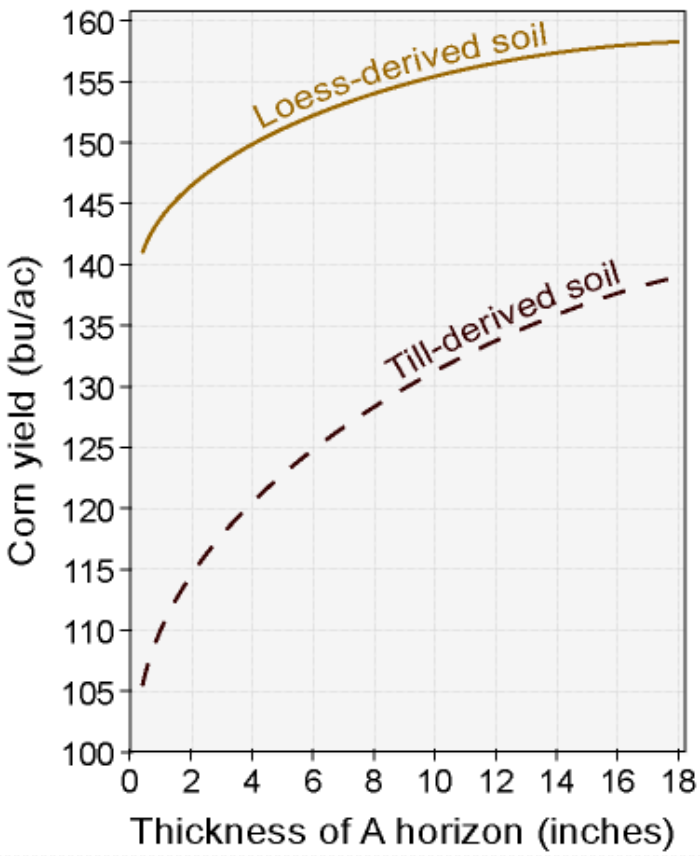
Mean surface temperature in Europe 1850-2009, annual and by season[1].





[1]European Environment Agency. 2011. Mean surface temperatures in Europe 1850-2009, annual and by season.
http://www.eea.europa.eu/data-and-maps/figures/mean-surface-temperature-in-europe

Does soil erosion affect soil productivity?



Kazemi, Masoud, L.C. Dumenil, and T.E. Fenton. 1990. Effects of accelerated erosion on corn yields of loess-derived and till-derived soils in Iowa. Final report for Soil Conservation Service, Agreement No. 68-6114-0-8, Des Moines, IA.

Concluding Thoughts

Agricultural Demand

Resource Demand

Resource Degradation &/or Depletion

Concluding Thoughts

Maintaining Productivity is a MUST