The How of Great Corn Yields in a Drought Year

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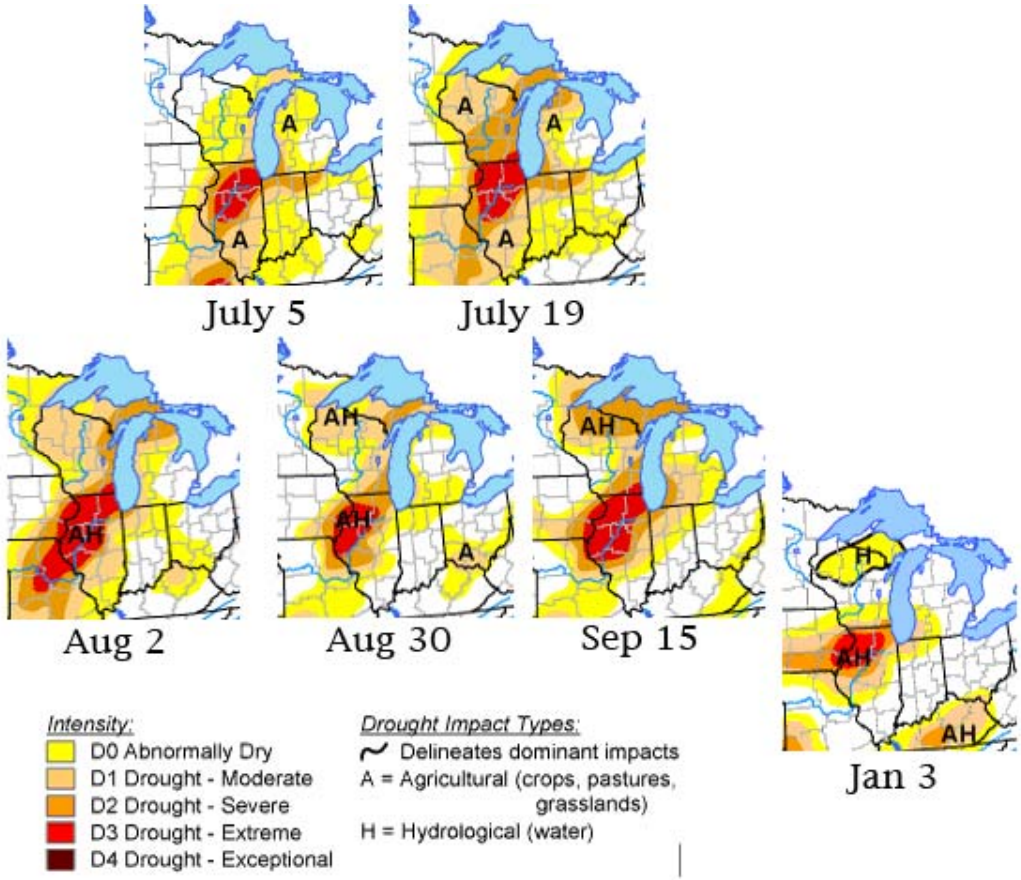
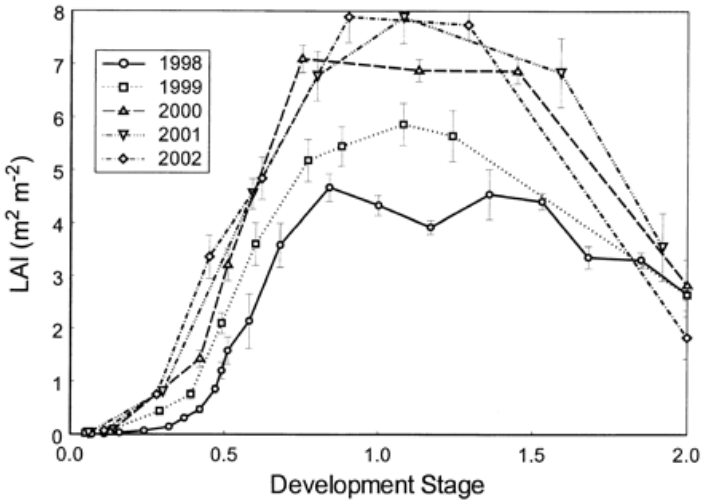
USDA Drought Assessments

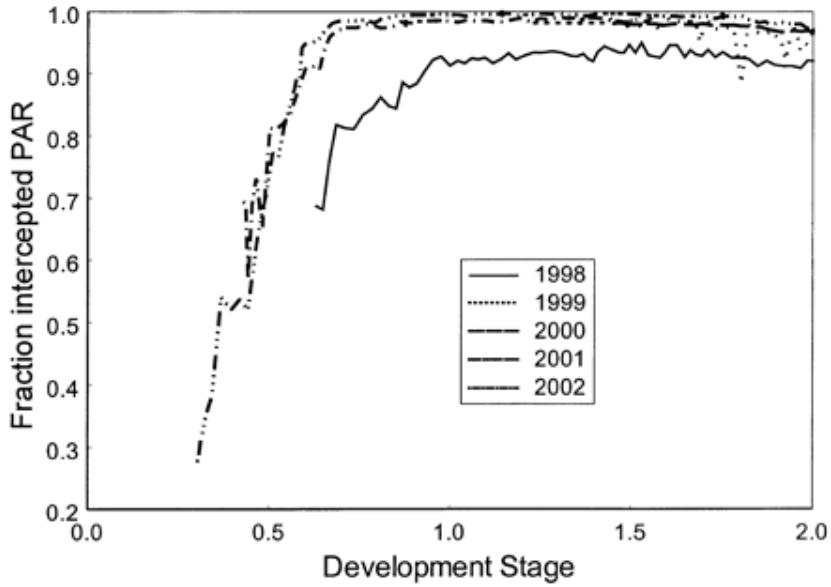


Resource Capture

- Crop growth depends on capture of resources
  - PAR (sunshine), CO2, water, minerals
- PAR: leaf area and sunshine
- water: rain, soil storage, roots

Leaf Area Index:
layers of leaf over soil





LAI > 3 usually means
almost complete
absorption of PAR

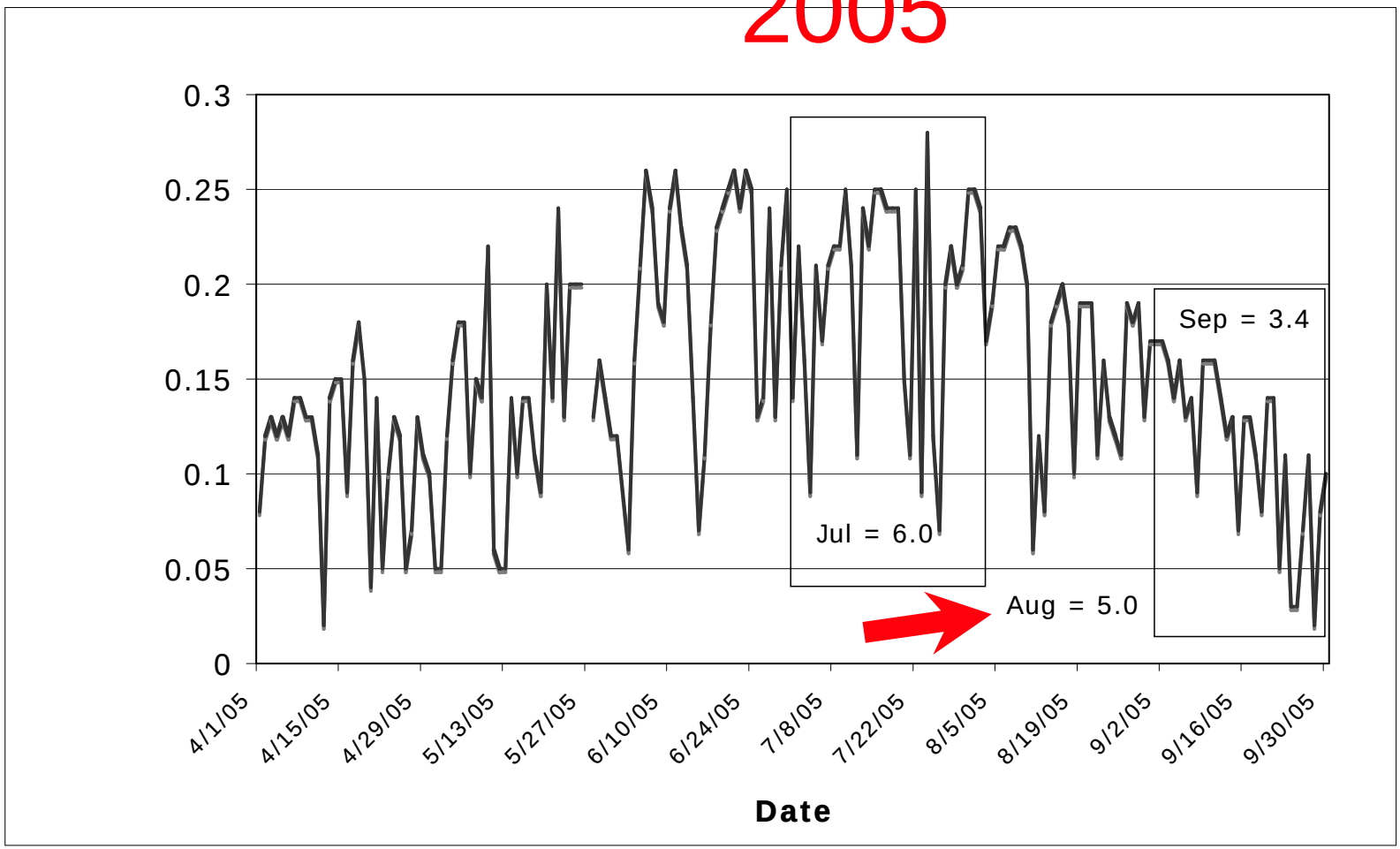
Enough PAR?

- Aug 1-Sep 10: 425 MJ PAR/m2 at Arlington
- Correcting for incomplete absorption, about 370 MJ/m2 collected by crop
- RUE (radiation use efficiency) of corn about 3.7 g/MJ => biomass ~242 bu/acre
- If 10% is cob, could yield 218 bu/acre, 4% below 227 bu/acre observed

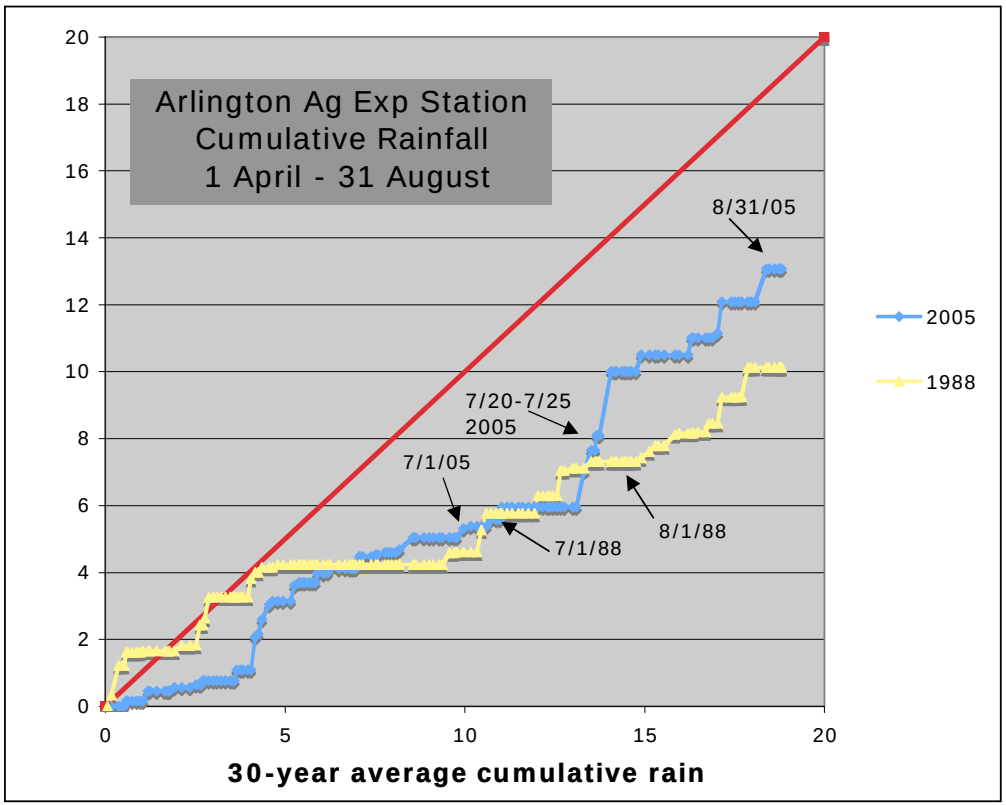
Enough Water?

- Potential (maximum) evapotranspiration estimated by “Priestley-Taylor” equation
- Based primarily on sunshine
- Good for well-watered vegetation with complete canopy (LAI > ~3)

P-T PET at Arlington in 2005



Rainfall late July-Aug = ~6 in



Soil PAW?

- Soil must be able to retain rain
  - Plant Available Water - as a depth
- Silt Loam, 4-ft thick rootzone would have PAW about 0.20 * 4 ft = 9+ inches

Summary

- 2005 remembered as drought year, but new record statewide corn yield...
- Rains in late July saved crop
- “Back-of-envelope” calculations confirm enough sunshine and radiation to produce grain observed at Arlington