

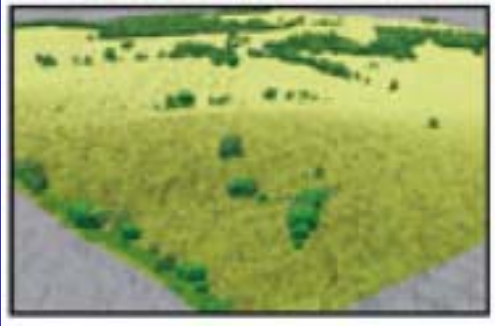
Forecasting C dynamics in the Great Plains: Stories of precipitation and land use

S. A. Billings, Alexis Reed, Lisa Tiemann
Department of Ecology and Evolutionary Biology
Kansas Biological Survey
University of Kansas









1941



1966



2002

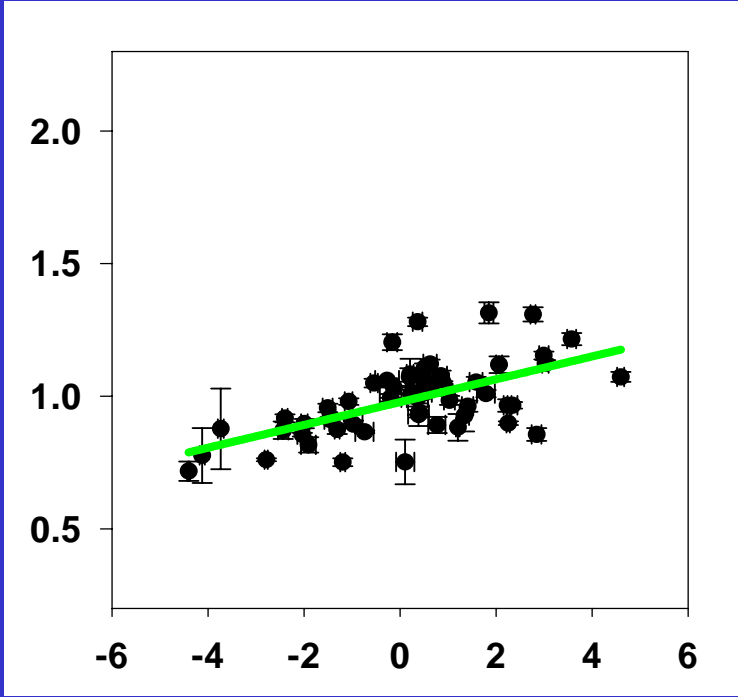
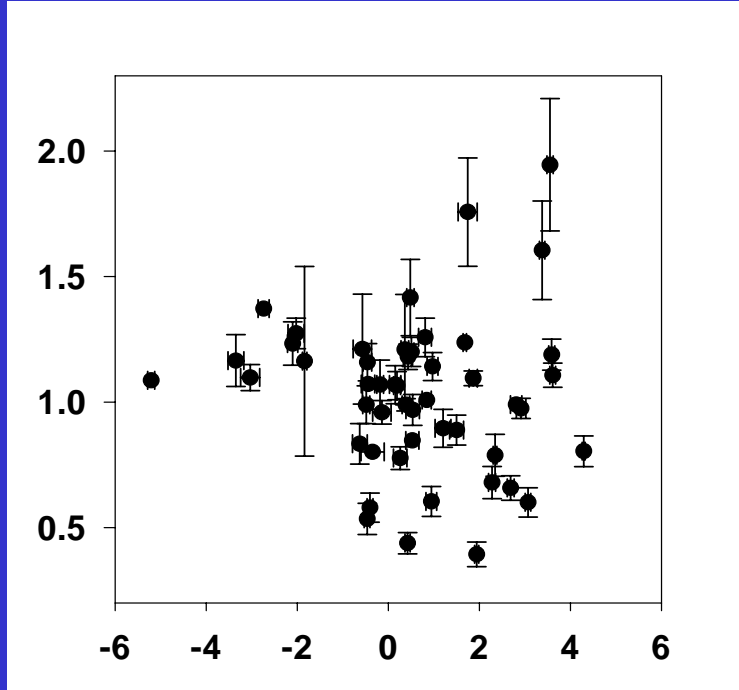
How will developing woodlands survive in a warmer region with extended periods of drought?



Northern red oak

Mesic  Xeric

RWI

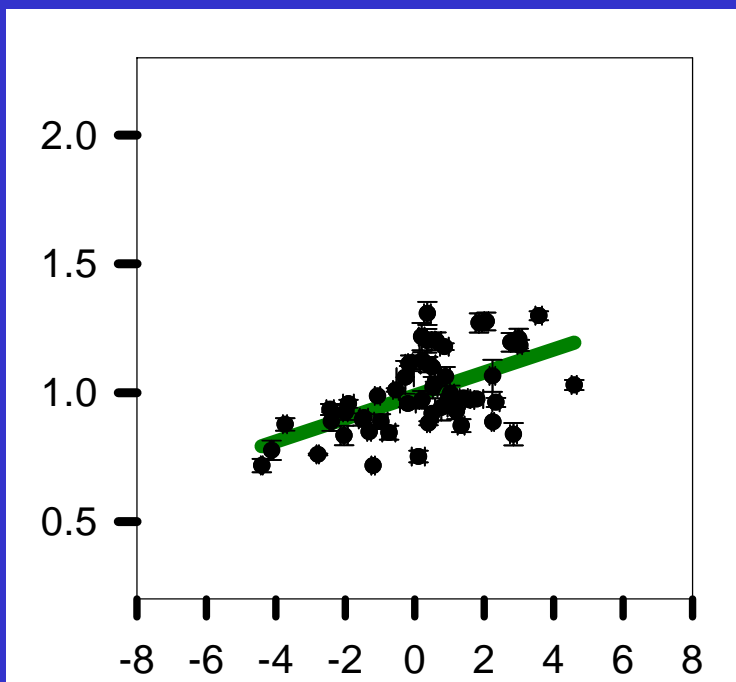


PDSI

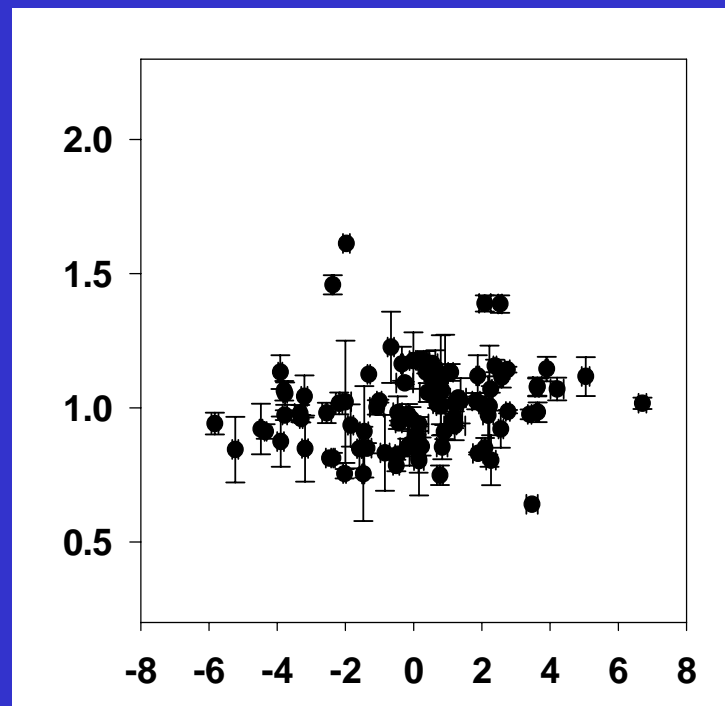
Bur oak

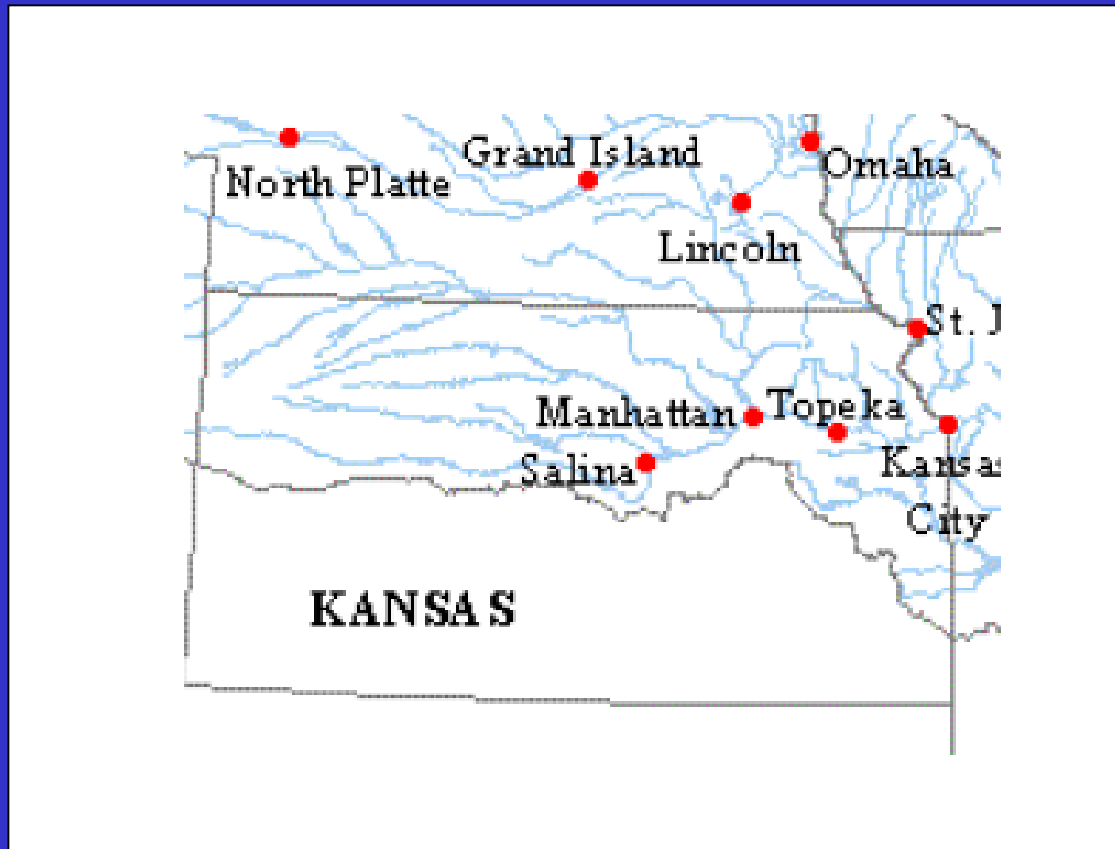
Mesic  Xeric

RWI



PDSI

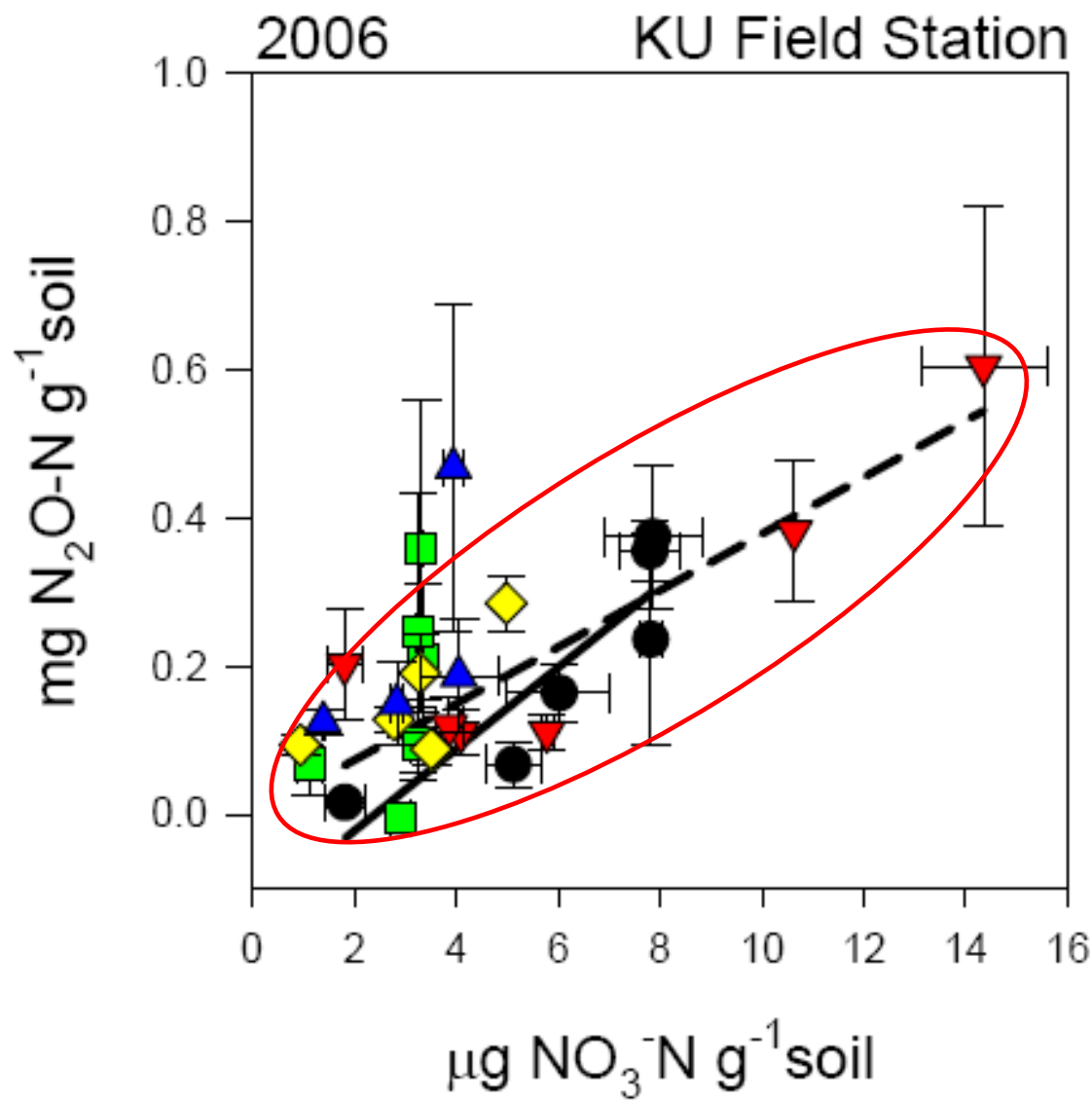




Do trees in the Great Plains depend on surface water to such an extent that climate change will influence their ability to survive?

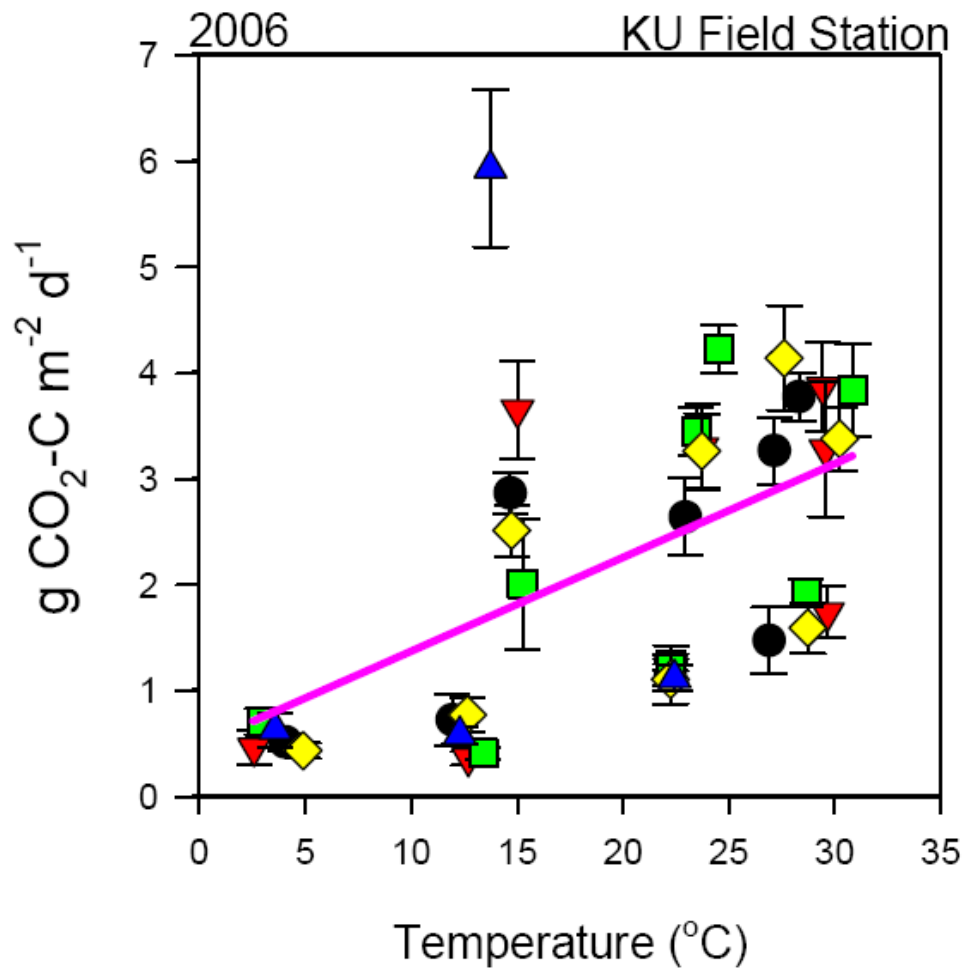
Tree growth represents a valuable method of C capture.

What about C liberation?



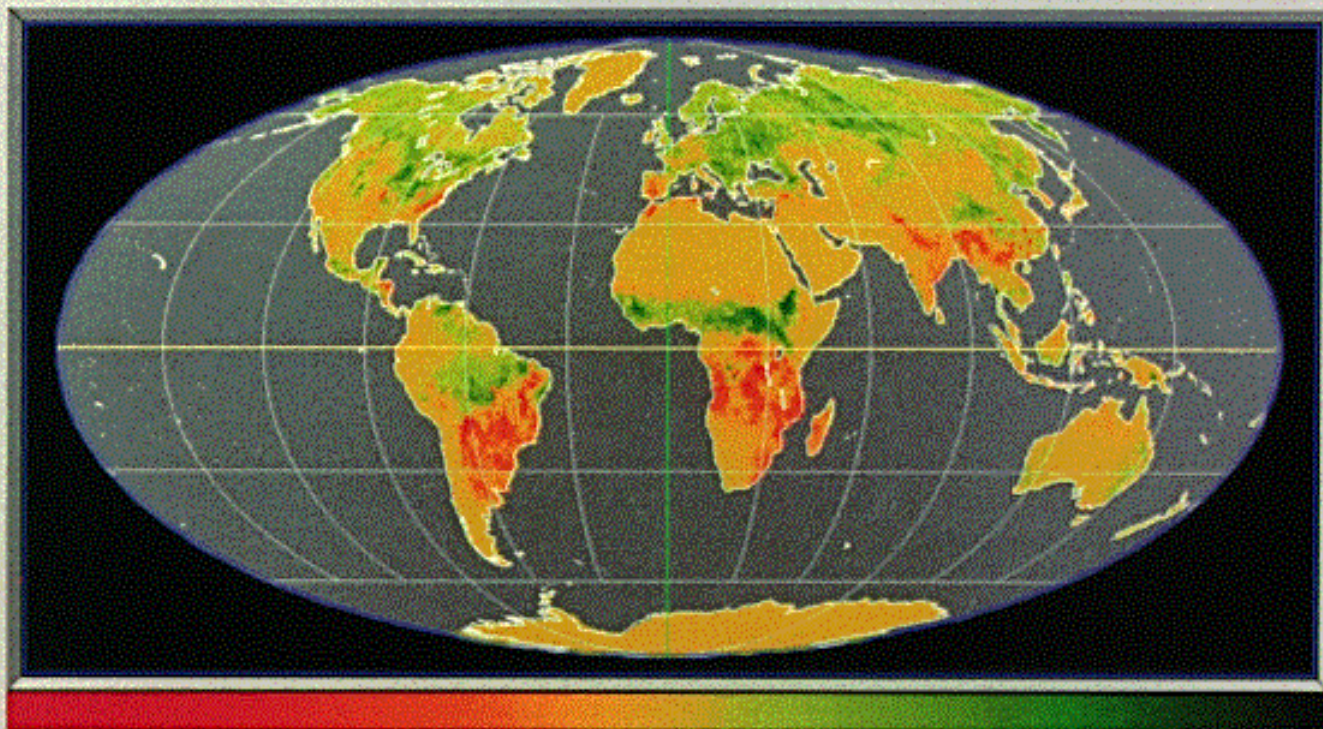
- Fertilized grassland
- ▼ Fert/hayed grassland
- Hayed grassland
- ◆ Early "old field" succession
- ▲ Woody succession

~80% of the variance in field N_2O production in fertilized plots is explained by NO_3^- availability.



~29% of the variance in soil respiration in all plots is explained by soil temperature.

NASA Ames Research Center -- Ecosystem Modeling Group



OUT

IN

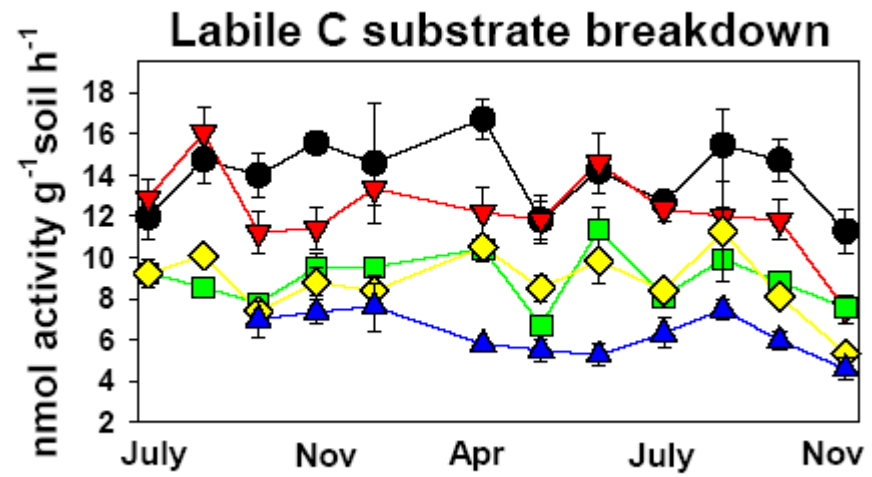
-120 -100 -80 -60 -40 -20 0 20 40 60 80 100

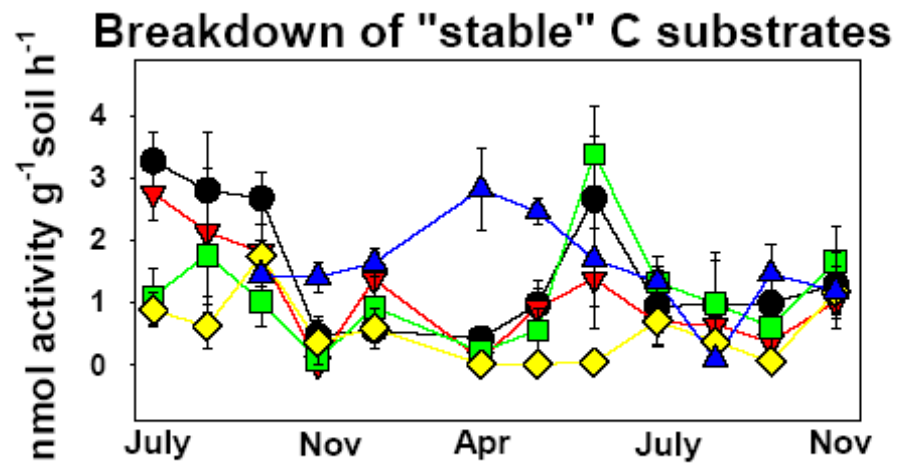
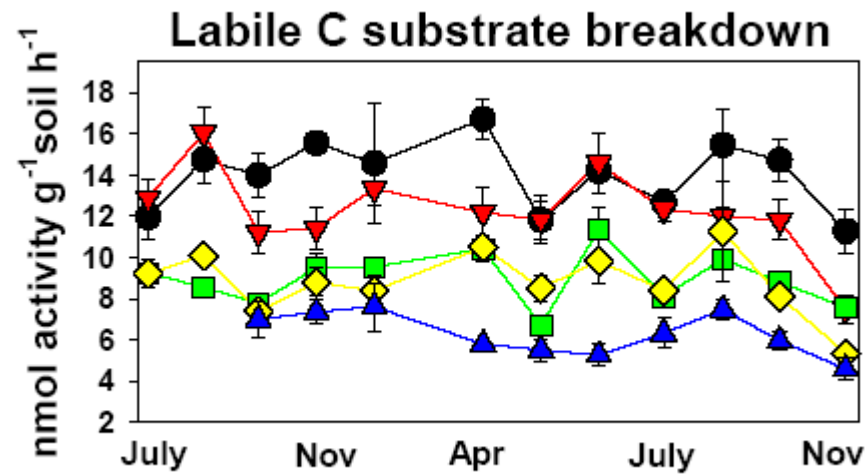
CASA Model - Respiration of Biosphere - $\text{g C/m}^2/\text{mo}$ - June

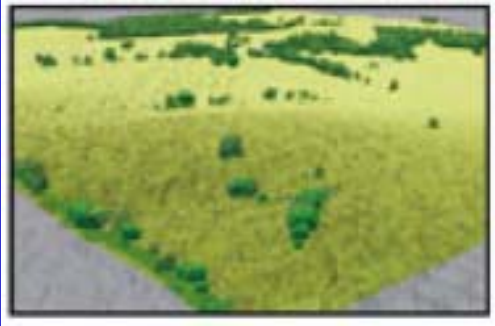
Temperature and moisture are proximate causes . . .
what is a more *direct* driver of these C fluxes?

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what is a more *direct* driver of these C fluxes?









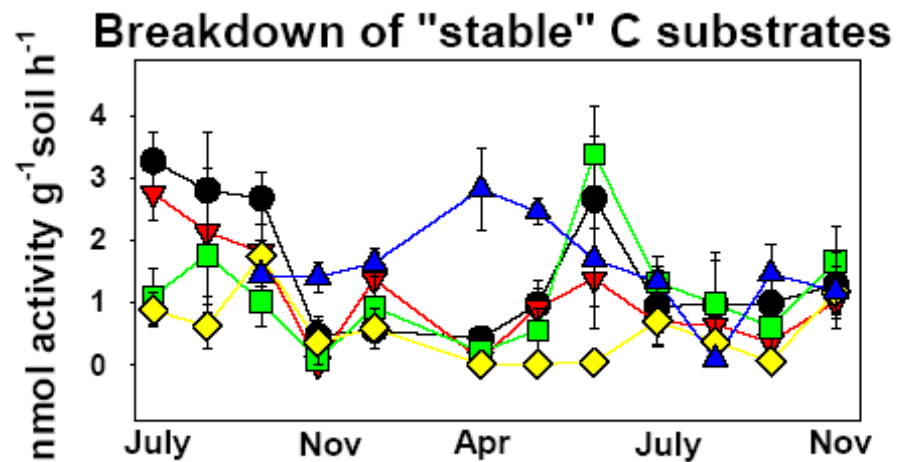
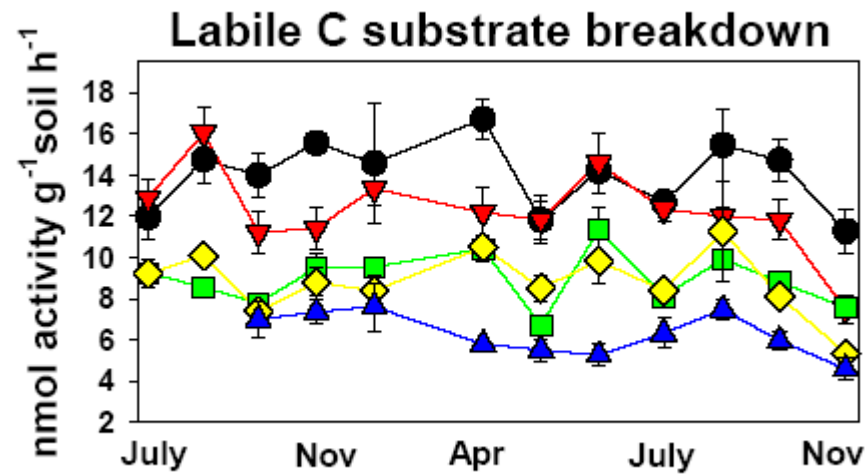
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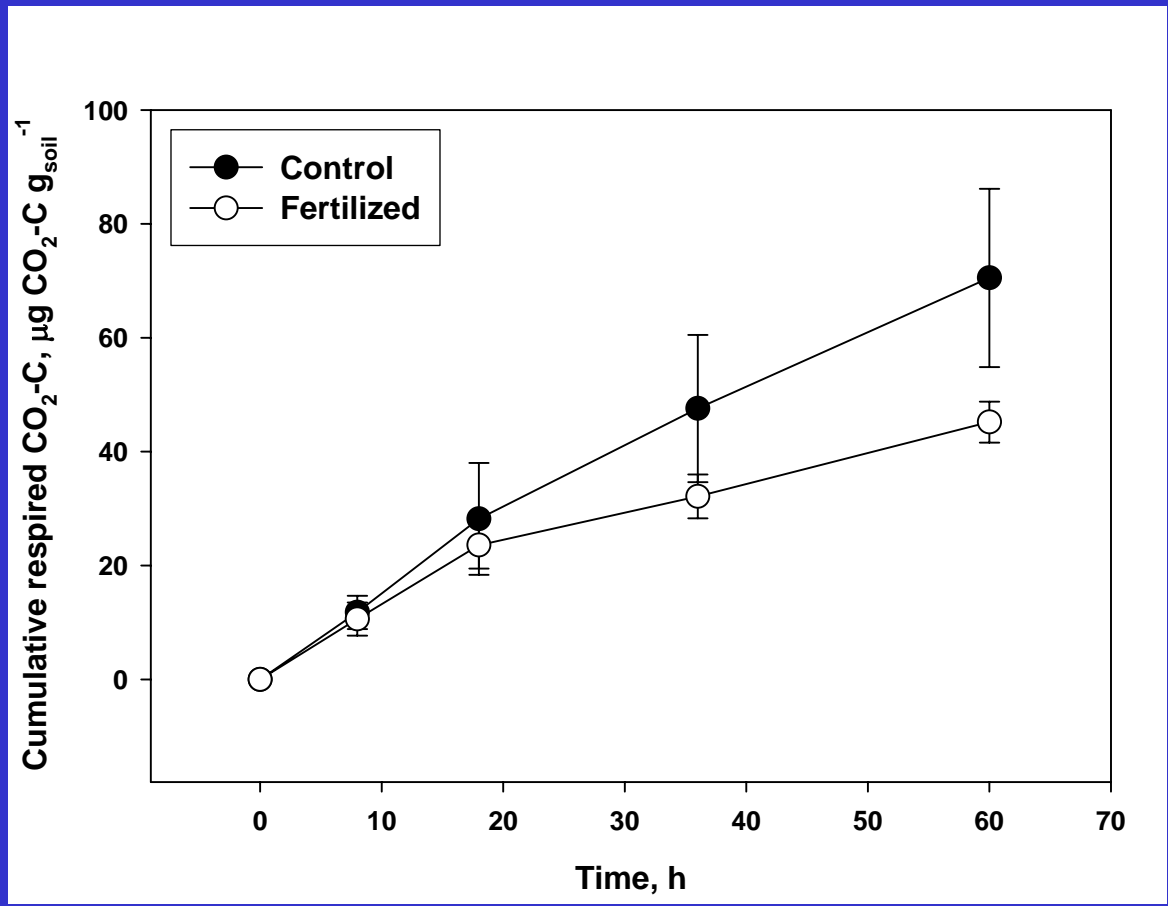


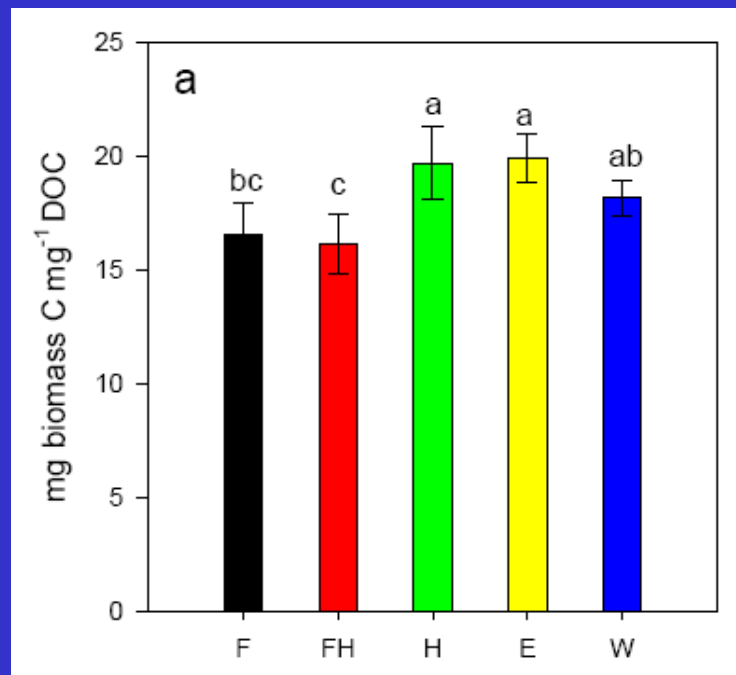
How will N availability change in the future?

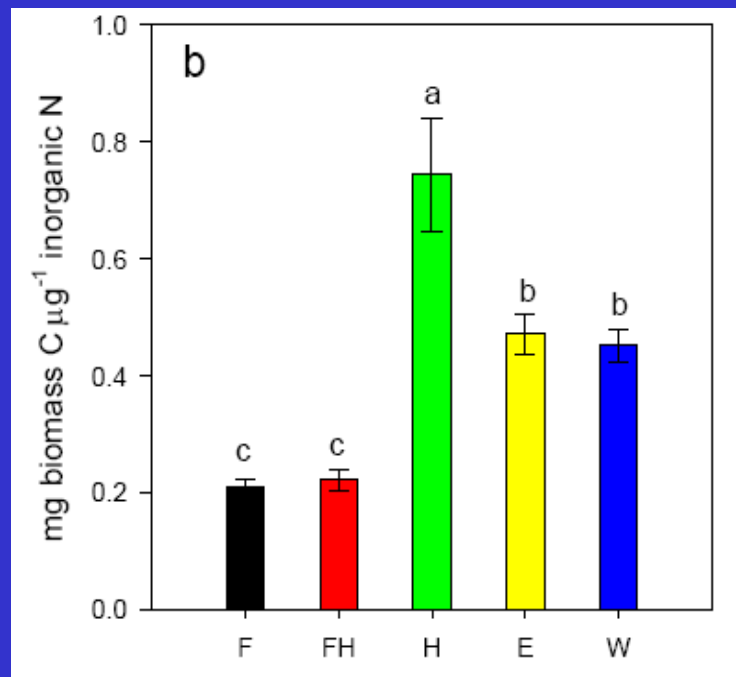
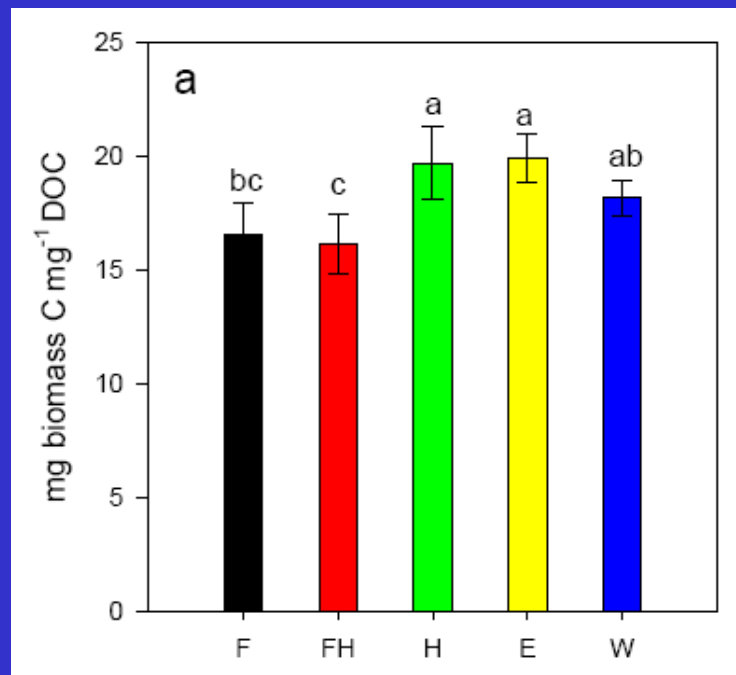
Fertilization

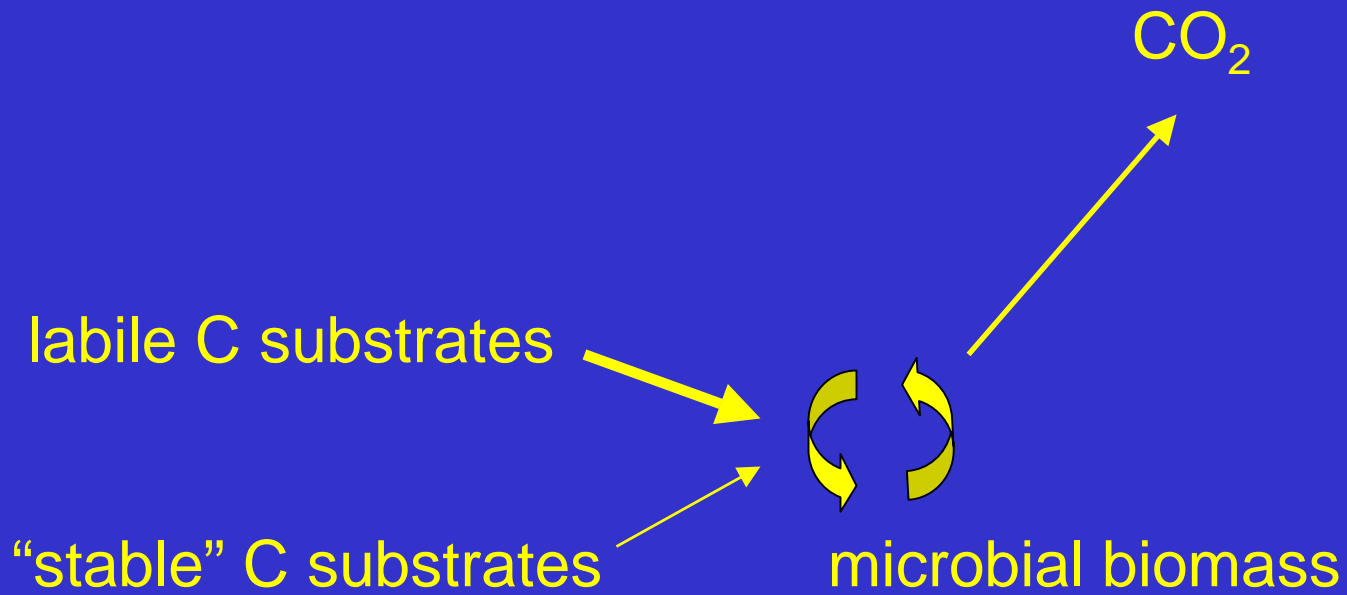
N deposition

Increases in net N mineralization?







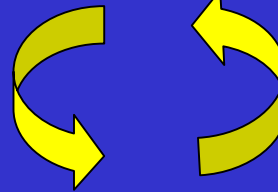


Increased N availability

Woody plant development

labile C substrates

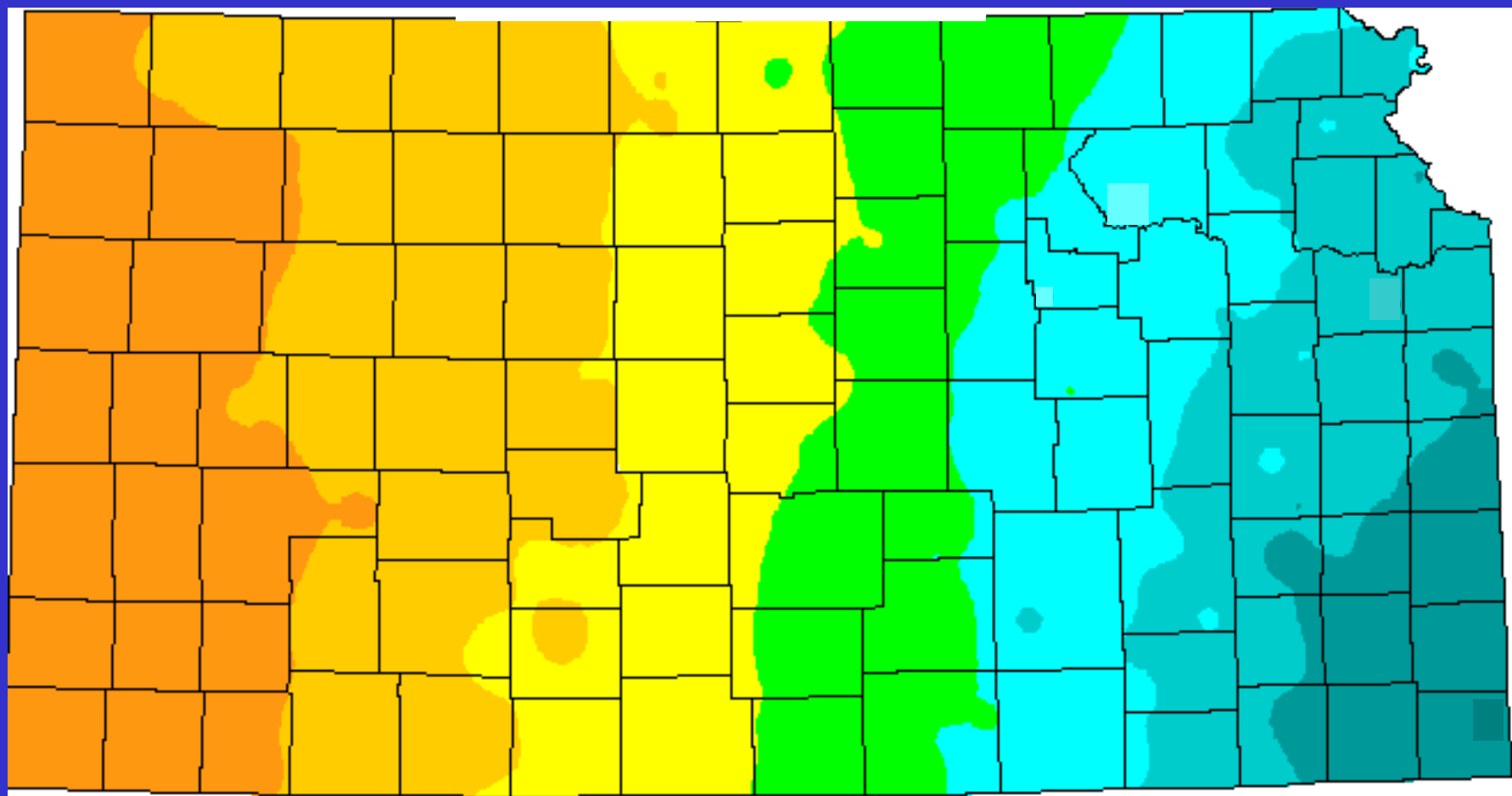
“stable” C substrates



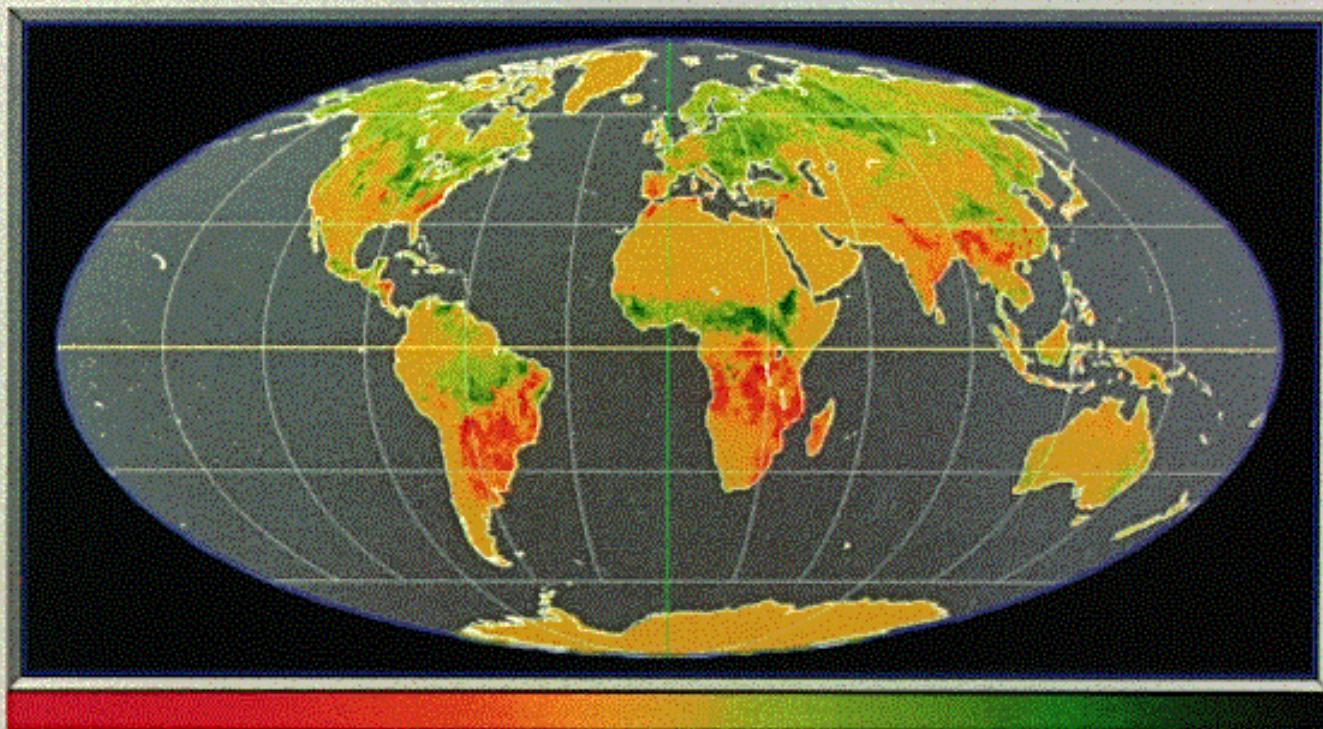
CO₂

microbial biomass

This growing season:



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CASA Model - Respiration of Biosphere - $\text{g C/m}^2/\text{mo}$ - June



